

# Machine and Tool **BLUE BOOK**


*A Hitchcock Publication*




**NOW - "FASTER  
FLOOR-TO-FLOOR  
TIME," SAYS  
ALAN MATTISON,  
president,  
NATIONAL MACHINE TOOL  
BUILDERS ASSOCIATION  
—See page 123**


**JUNE · 1960**

## a message to owners of MARVEL HACK SAW MACHINES

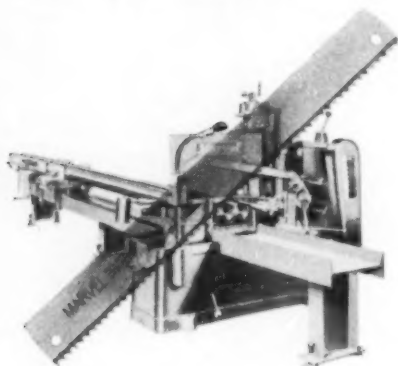
If you are the owner of a MARVEL Hack Saw Machine, check the name on the blades being used in it. If they are not MARVEL Blades, the chances are very good that you are not getting all the cutting-off speed, accuracy, and economy you paid for when you bought a MARVEL Saw. 

Consider this fact. The hack saw *blade* is the cutting tool that actually does the cutting job. If the machine is expected to deliver its full efficiency, the blade must possess a ruggedness comparable to that of the machine.  Isn't it logical, then,

that the blades you use be as carefully selected as the machine itself? Here is another fact: The MARVEL High-Speed-Edge Hack Saw Blade was designed specifically to withstand the heavy feed pressures and high cutting speeds your MARVEL Hack Saw can deliver.

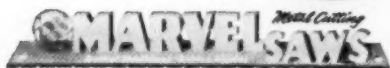
 Only MARVEL UNBREAKABLE Hack Saw Blades can be safely tensioned taut enough to provide the maximum rigidity of the cutting tool necessary for accurate cutting-off; and at

the same time, protect both the operator from injury and the machine from damage that so frequently occurs with "breakable" blades.



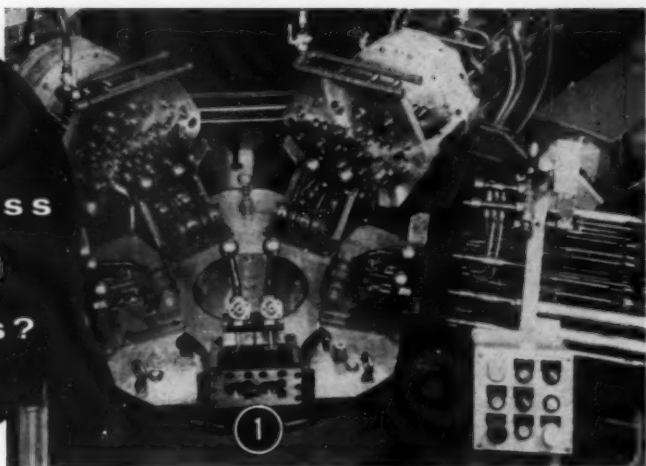
**ARMSTRONG-BLUM MFG. CO.**  
5700 Bloomingdale Avenue • Chicago, Illinois

Why not be certain your MARVEL saw is delivering the high performance you had originally purchased, by using the only blade capable of utilizing the power and accuracy built into the machine? MARVEL Hack Saw Machines and MARVEL High-Speed-Edge Blades are an unbeatable combination. MARVEL High-Speed-Edge Hack Saw Blades are stocked and sold by leading Industrial Distributors everywhere.



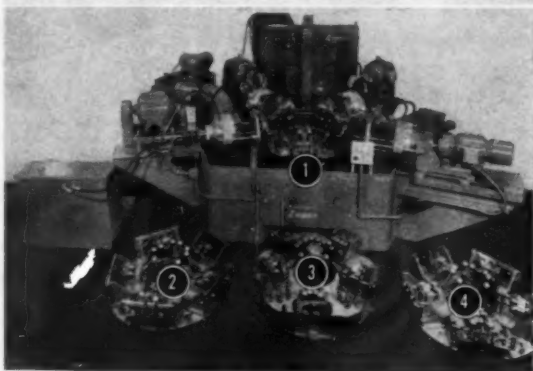


why  
gearless  
drill  
heads?



Four fixture assemblies, mountable on a common index table, have five stations each for drilling, reaming, and tapping left- and right-hand cylinders at 400 pieces per hour. In all, 2800 holes are produced.

because  
**Zagar**  
design uses more  
spindles in  
smaller space with  
minimum tooling  
and  
requires short  
change-over time



Zagar gearless design permits flexibilities in building machinery with results not obtainable elsewhere. By using many spindles and tooling more parts in one machine, fewer units, less space, and little change-over time are required.

Gearless design allows close center hole production without changing spindle locations

in heads. Varying hole patterns can be obtained without additional heads. Interchangeable fixtures on the same index table, therefore, compound the potential hole production—in one basic unit.

Find out how Zagar can program your entire drilling, reaming, and tapping job by sending us a part for an engineering study.

Ask for Manual B-6 for basic Zagar theory:

**Zagar** INCORPORATED  
23900 LAKELAND BLVD. • CLEVELAND 23, OHIO

**USE MORE SPINDLES TO DO MORE WORK**

Use postpaid card. Circle No. 201



## *Cut toolmaking costs with a **Wade***

### *#94 FINISHING LATHE*

Every design feature built into the Wade Finishing Lathe has one aim in view: to make this machine the *most convenient and the fastest to use* for toolmaking and limited production. The Wade Model #94 has a 9" swing, 1-1/16" collet capacity and will accept 15" between centers.

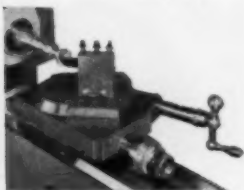
*Write for literature.*

Sold by Pratt and Whitney Co., Inc. in most areas.

**THE WADE TOOL CO.**

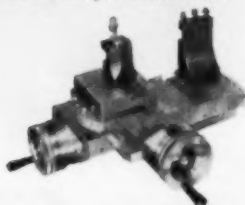
WALTHAM 54, MASS., U.S.A.

#### **SOME OF THE MANY COST-SAVING FEATURES**



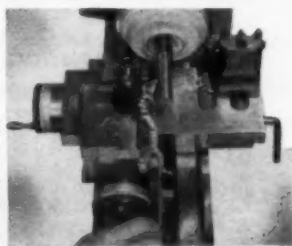
#### **RADIUS TURNING ATTACHMENT**

Concave and convex surfaces are readily generated after a simple set-up with a direct-reading dial indicator. Worm gear feeding insures a finely controlled finish.



#### **REAR SLIDE CUT-OFF**

The rear tool station is an added feature to the traditional convenience and accuracy of the Wade Super Slide Rest. A cut-off tool may be left in readiness to avoid tool changing.

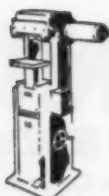


#### **DIRECT READING DIALS**

Large satin-chrome dials read directly in thousandths of an inch and are resettable to zero.

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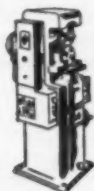
MACHINE TOOL BLUE BOOK



*General purpose  
Roll-Marking  
Machines*



*Rapid production  
Roll-Marking  
Machines*



*Precision  
Graduating  
Equipment*



*Mechanical and  
Pneumatic Marking  
Presses*



*Bench  
Marking  
Machines*



*Automatic  
Numbering  
Heads*



*Precision  
Marking  
Dies*



*Hand  
Marking  
Tools*

# *Permanent* **INDENTED METAL MARKING**

For over half a century Noblewest has been the leader in designing and building machines and tools for faster, better marking at lower production costs to users. Noblewest marking is *permanent indented marking* . . . good for the life of your product. Illustrated are the basic types of marking equipment in the Noblewest line. It includes machines for marking, graduating, embossing and serial numbering at production speeds up to 15,000 pieces per hour with full automation. Whatever you want to *permanently mark*, it will pay you to specify NOBLEWEST. Write for comprehensive catalog. Noble & Westbrook Manufacturing Company, 9 Westbrook Street, East Hartford 8, Connecticut.

A few desirable territories open to qualified representatives.

MARK IT BEST WITH

# **NOBLEWEST**

**NOBLEWEST  
IMPROVED  
MARKING  
DEVICES**

MARKING  
NUMBERING  
EMBOSSING  
GRADUATING

# ARMSTRONG

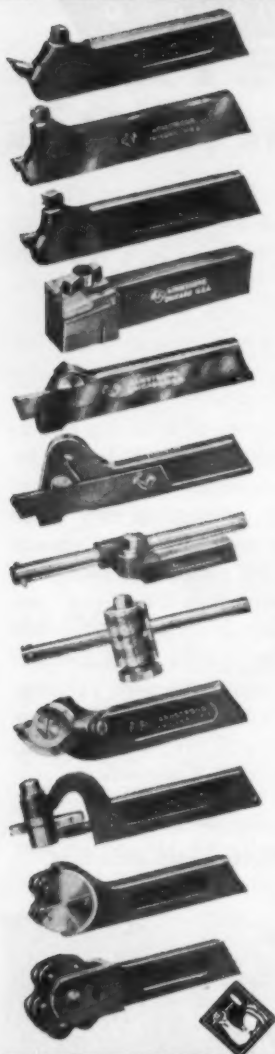
## TOOL HOLDERS

**A Correct Tool for Every Lathe Operation**

You can save time (and money) by ensuring that your machine tools are equipped with *adequate numbers* of the correct ARMSTRONG Tool Holders. The ARMSTRONG System of Tool Holders includes correctly designed tools for every standard operation on lathes, shapers, and planers, and for many operations on turret lathes and screw machines. By utilizing the ARMSTRONG System of Tool Holders, you can reduce tooling costs, eliminate down time in tooling up, operate your machine tools at maximum feeds and speeds.

ARMSTRONG Tool Holders are long-lasting tools. They are strong beyond need, handy and efficient, profitable to use, and are readily available from your local ARMSTRONG Distributor.

**Check over your ARMSTRONG Tool Holder needs.  
Write for literature.**



*If you do not know the name of your local ARMSTRONG Distributor, inquire when asking for literature.*

**ARMSTRONG BROS. TOOL CO.** 5208 W. ARMSTRONG AVE CHICAGO 46, ILL.

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MACHINE and TOOL BLUE BOOK

# Machine and Tool BLUE BOOK

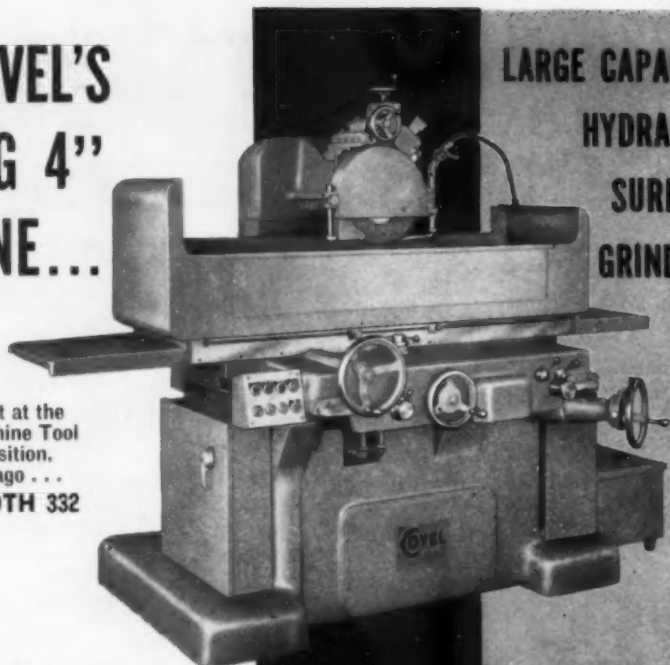
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1	Features In This Issue .....	99
2	Seen and Heard In Industry ....W. F. SCHLEICHER	101
<b>Feature Articles</b>		
Engineering and Tooling 3	Balancing Tool Life .....	HARRY CONN 105
Practical Die Maker 4	Third Year Of Apprenticeship .....	PAUL PRIKOS 109
Cutting Tools 5	Why Do Cutting Tools Fail? .....	DENNIS JONES 111
Process Engineering 6	Which Method Is Best? .....	ALLAN YOUNG 119
Interview 7	Alan C. Mattison, President of National Machine Tool Builders' Association, comments on problems confronting the industry and on the forthcoming show to be held in Chicago. ....	123
Grinding 8	Nose Cones—A Study In Grinding Technique .....	DARRELL WARD 131
Turning 9	Why Slow Down For The Cut-Off? .....	HORACE FROMMELT 138
Bending 10	What Do You Bend On A Bender? ..	DARRELL WARD 145
11	<b>Field Reports</b>	
Drilling, Fixturing	Improved Fixturing Plus Power Units Ease Strain On Machines and Men .....	163
Machine Tool Selection	New Tools And Techniques Keep United's Jets Flying .....	166
12	<b>Shop Hints</b>	
Assembly	Combined Operations Increase Valve Production And Quality .....	171
Milling	Pivoting Parallel Holds Taper Work In Vise— .....	H. GERBER 172
Grinding	Crush Grinding Often Best Method To Form Small Cylindrical Parts .....	174
<b>Departments</b>		
13	Free Literature .....	179
14	News Of Industry .....	191
15	What's New In Metalworking .....	211
16	Editorial and Business Staff Listing .....	306
17	Products Index .....	310
18	Index to Advertisers .....	314
	Sales Representatives .....	96



# COVEL'S "BIG 4" LINE...

See it at the  
Machine Tool  
Exposition,  
Chicago...  
**BOOTH 332**



## LARGE CAPACITY HYDRAULIC SURFACE GRINDERS

Yours — for no more than you would pay for ordinary machines— surface grinders that enable you to handle die grinding, jig and fixture grinding and production work fast and efficiently. These Covell Surface Grinders — with their hard chrome tableways and other top-quality features — assure you micro-precision performance at lowest possible cost. Your investment in a Covell will pay off many times over — ask any Covell owner.

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grinds work  
8" x 24" x 18" high

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grinds work  
14" x 24" x 18" high

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grinds work  
12" x 36" x 18" high

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Micro-Precision a Covell Tradition — Since 1874

**PRECISION  
GRINDERS**

BENTON HARBOR, MICHIGAN

Write, wire or call TODAY for complete information and prices on the complete line of Covell Precision Grinders. Ask for Bulletin B860.

Use postpaid card. Circle No. 206

MACHINE and TOOL BLUE BOOK



# Finger Prints Can't Be Faked!

To assure positive identification of your part or product, it should be marked with your trade name, serial or part number, inspection or code symbol, dates, etc. This essential identification can best be obtained *permanently* through steel stamp marking.

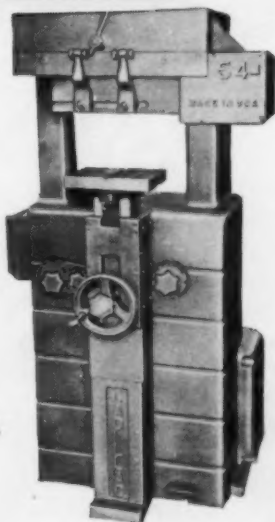


**POSITIVE  
IDENTIFICATION**

**Engineered Marking by CADILLAC . . . cuts costs**

## CADILLAC NO. 54 HYDRAULIC MARKING MACHINE

Here a single pressure control regulates full range of pressures—marks round, flat and irregular surfaces. Can mark a very light legend into nonferrous metals . . . extremely deep legends into tough steels. It is ruggedly built and simple to operate.

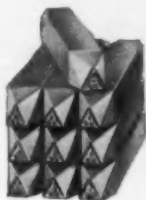


Write for  
Bulletin No. 54.



**STAMAX\* ROLL DIES**

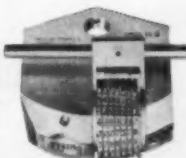
Developed by CADILLAC for the  
REALLY tough marking job.



**SPECIAL STAMAX\* CODE  
INSPECTION STAMPS  
AND SYMBOLS**

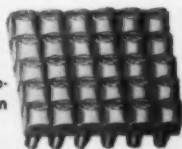
Hard and tough—won't mushroom, chip or split. Priced right.

**CADILLAC MODEL NO. 32  
Automatic Numbering Head  
(Special Barrel Style Shown)**  
Perfect for consecutive numbering. Standard models available.



**CADILLAC STAMAX\*  
MARKING DIES**

. . . Guaranteed absolutely true reproduction of your requirements.



For further information regarding marking devices and equipment, write for Bulletin No. 41.

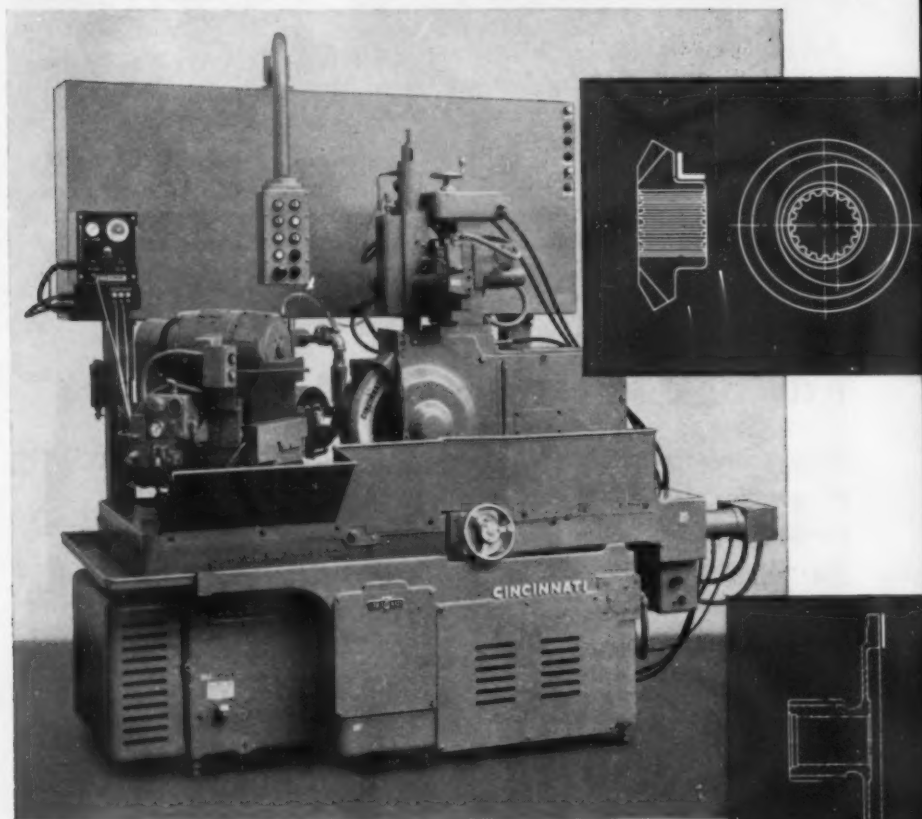
\*STAMAX means.  
Carefully selected alloys specially heat treated and tempered



**CADILLAC STAMP CO.**  
17321 RYAN ROAD • DETROIT 12, MICH.  
TELEPHONE: FOREST 6-0500



# CINCINNATI COMBINES SUPERIOR



**Production and quality** are automatically controlled by the ingenious tooling and extra equipment, principally of standard design, on this CINCINNATI FILMATIC No. 2 Chucking

Grinder. These fine precision grinders are built in two sizes:

No. 1—Capacity 0" to 4" diam.

No. 2—Capacity 2" to 10" diam.

Catalog No. G-685-1.



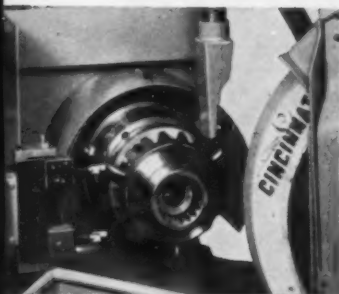
Booth No. 1034



BUILDERS OF PRECISION GRINDING MACHINES: CENTERTYPE • CENTERLESS • MICRO-CENTRI

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

# CHUCKING GRINDER PERFORMANCE with WIDE VARIETY OF TOOLING



**Single-spindle headstock**, automatic gage sizing, pneumatic chuck with interchangeable jaws for four sizes of parts.

**Part Name** . Bevel gear  
**Operation** . Finish grind diameter, adjacent face, radius  
**Material** ... 8625H steel  
**Production** . 72 per hour



**Two-spindle headstock**, pneumatic diaphragm chucks, automatic truing, manual loading.

**Part Name** . Transmission gear  
**Operation** . Grind face  
**Material** ... Steel  
**Production** . 94 per hour

Application of the chucking method of grinding is not always well defined. But Cincinnati Grinding Specialists know exactly when it should be used . . . they have the opportunity to weigh it against the centertype and centerless methods. In shops throughout the country, manufacturing lots of several hundreds or thousands can be ground at the lowest cost on CINCINNATI FILMATIC Chucking Grinders.

These fine precision grinding machines are built with single-spindle or two-spindle headstock. They can readily be tooled up with a wide range of positive chucking and work loading arrangements and other highly productive features such as . . . manual or push-button profile truing; automatic cross feed compensation; crush truing; automatic gap eliminator; automatic air-electric gage sizing.

The machine itself incorporates many feature-advantages of long productive life and accurate performance, such as FILMATIC grinding wheel spindle bearings; variable-angle headstock positioning; extra sensitive automatic dual rate infeed; two-speed cross slide handwheel; super-accurate headstock spindles. On applications where it can be applied the chucking method of grinding is superior . . . for accuracy, high production, low cost.

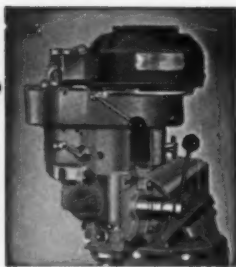
Complete specs for CINCINNATI FILMATIC Chucking Grinders are in catalog No. G-685-1. Write today for your copy.

ROLL • CHUCKING • CENTERLESS LAPPING

## CINCINNATI

GRINDING MACHINE DIVISION

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*variable speeds 60 to 3300 r.p.m.*



## **TREE 2UVR VERTICAL MILL**

Spindle speeds infinitely variable from 60 to 3300 r.p.m. make the 2UVR Vertical Mill useful for a wide range of work not heretofore accomplished by mills of this size. Exclusive features include:

- Roller Spindle Drive
- Automatic Collet Closer
- Head to Ram Mounting
- Power Table Feed and Rapid Traverse
- Turret Locking Mechanism



For full information write,  
**TREE TOOL & DIE WORKS**  
1600 JUNCTION AVE., RACINE, WIS.

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MACHINE and TOOL BLUE BOOK

# ANOTHER "BUILDING BLOCK" BY

**HARTFORD**  
*Special*

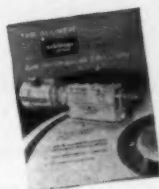
THE NEW Model 17-400



## AIR HYDRAULIC DRILL UNIT

- 4" STROKE • UNITIZED • SMALL SIZE
- INTEGRAL AIR VALVE • FIELD TESTED

COMPLETE INFORMATION...on the new Model 17-400 Drill Unit, including dimensions, specifications and other engineering data, is covered in Circular No. GC-400. Write now for your free copy. The Hartford Special Machinery Co., 3200 Homestead Ave., Hartford 12, Conn.



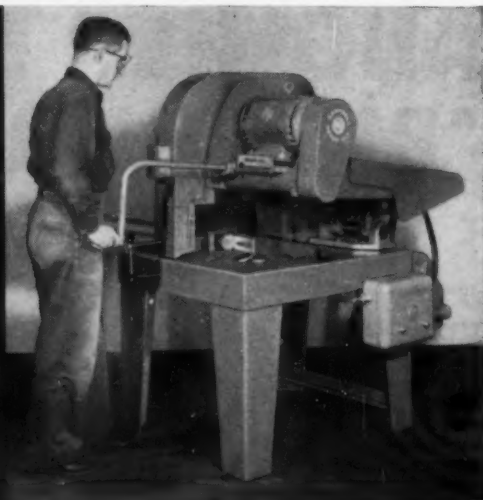
**HARTFORD**  
*Special*

**THE HARTFORD SPECIAL MACHINERY COMPANY**  
HARTFORD 12, CONNECTICUT

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# NEW!

## GREATEST CUT-OFF CAPACITY IN ITS CLASS!



• This newest addition to the Sever-All line of abrasive cutting machines—the Model 2-A—provides greater cutting capacity and more flexibility than any other machine in its class. Check these important advantages:

**Big capacity** • cuts 4" round or square solids, 6" diameter tubing or standard pipe, 6"x1" flat stock, 6" angle iron and 8" channels. Cuts practically all metals.

**Fast operation** • accurate cuts at 2 to 3 seconds per square inch. **Power oscillation** • oscillation is the forward and backward motion of the cutting wheel as it is fed down into the cut. It provides extra cutting capacity, longer wheel life, cooler cutting and reduced operator fatigue. **Quality cuts** • clean, smooth cuts, require little or no finishing operation. **Economy** • Sever-All wheels, developed especially for the Model 2-A, provide lowest cost per cut.

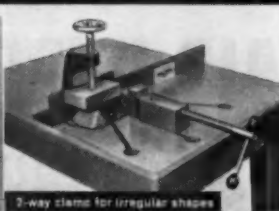
### VARIETY OF WORK HOLDERS GIVES UNUSUAL VERSATILITY



V-block with quick-action clamp



Angle-cutting work holder



3-way clamp for irregular shapes

• Choose the work holders you need from several optional arrangements. These include the vise-type holder shown on the ma-

chine at top, plus the V-block, angle-cutting and 2-way clamp fixtures above. Screw-type and quick-action clamping interchangeable.

*Write for details on the new Model 2-A Sever-All abrasive cutting machine. Ask for Bulletin DH-299*

## SEVER-ALL ABRASIVE CUTTING MACHINES

Allison-Campbell Division, American Chain & Cable Company, Inc.

937 Connecticut Avenue, Bridgeport 2, Conn.

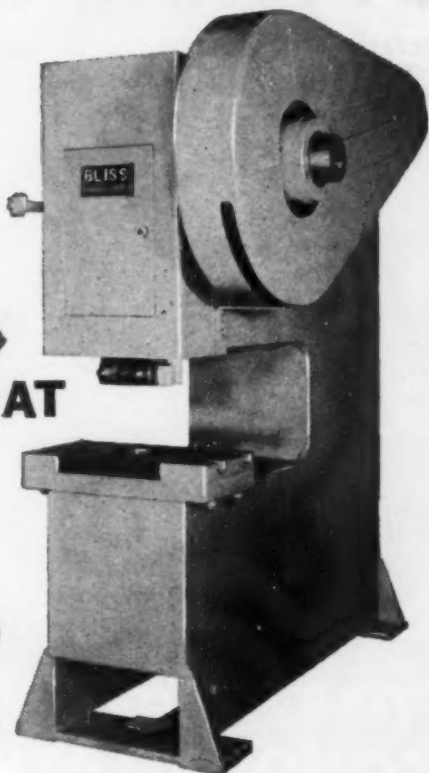
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**NEW**  
line of  
Bliss presses  
featuring

**DEEP THROAT**

All moving  
parts are  
interchangeable  
with standard  
inclinables



Rugged, compact, these reinforced welded steel frame presses are designed to give maximum rigidity and minimum "spring" under load.

All moving parts enclosed for greater safety—yet instantly accessible for adjustment. Probably most important is that these parts are *standard Bliss inclinable press parts*. This means you can be sure of quick parts service wherever you're located!

Sizes range from 4-ton bench models with a 12" throat to a 60-ton press with a throat almost three feet deep. You can also have extended bodies, mechanical or air friction clutches, automatic lubrication, other features. Why not write for details.

**BLISS**  
SINCE 1857

*is more than a name . . . it's a guarantee!*

**E. W. BLISS COMPANY** • Canton, Ohio

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# LOW COST, Buffing, Polishing, Deburring

REPLACEABLE MULTI-V-BELT  
SHEAVES CONTROL  
SPINDLE SPEED

CONVENIENT HAND BRAKE  
STOPS SPINDLE OVER-RUN

CAPACITY—  
10 TO 20 HP

CARBON ALLOY  
STEEL SPINDLE  
RUNS IN  
PERMANENTLY-  
LUBRICATED  
BEARINGS

SIMPLE,  
STURDY  
BASE

LOCK PIN HOLDS  
SPINDLE STATIONARY  
FOR WORK WHEEL  
REPLACEMENT

AVAILABLE WITH  
ENCLOSED BASE  
IF DESIRED.

## Murray-Way's NEW ECONOMY LATHE!

This new lathe has all the essential features of an expensive, top performance lathe at only a fraction of the cost. All unnecessary "frills" and usual inside base adjustments have been eliminated, leaving a top quality spindle mounted on a simple, sturdy, stanchion type base.

Husky, permanently-lubricated bearings on wide centers assure maximum service life and ample work pressure support. Width between wheel flanges is 6", greater widths available if desired. Arbor sizes 1½" to 2". Floor area 43" x 34".

Write for illustrated literature and prices.



**MURRAY-WAY CORPORATION**

P. O. BOX 180 • MAPLE RD. EAST  
BIRMINGHAM, MICH.



# A million tons of cutting experience build performance into LADISH Saw Blades

When you buy Ladish blades... you get the added advantage of experience gained in cutting over a million tons of a broad range of metals... experience that means you will get sustained cutting efficiency, long, dependable blade life, and more cuts per dollar.

On your next requirement... buy Ladish blades... the complete, quality line marketed by one of the largest users of saw blades.

## LADISH CO.

Cudahy (Milwaukee Suburb), Wis.

**PROVE TO YOURSELF THE ADDED LIFE  
AND CUTTING EFFICIENCY  
OF LADISH BLADES**



### HANDY POCKET SIZE CUTTING GUIDE AND CATALOG

Contains answers to cutting problems. Provides quick reference to saw blade specifications. Write for Bulletin 578.

COMPLETE LINE OF TYPES AND SIZES  
AMPLE STOCKS • EFFECTIVE PACKAGING  
CONSULTATION SERVICE ON CUTTING PROBLEMS

**LADISH CO., Cudahy, Wisconsin**

Please send me without cost or obligation the  
Ladish Handy Pocket Size Cutting Guide and Catalog.

Name

Title

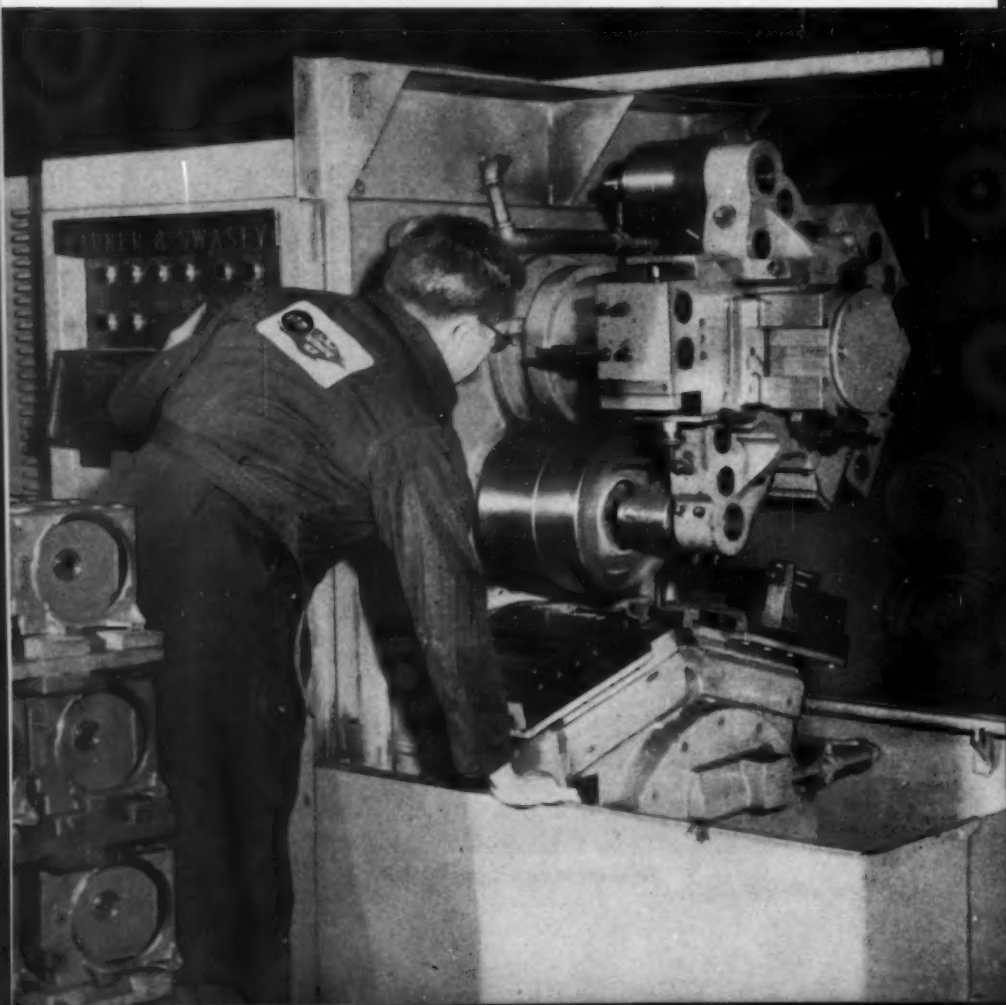
Company

Address

City  Zone  State

General Machine Co. replaces 30-year old turret lathe with Warner & Swasey 2AC Single Spindle Chucking Automatic to cut manufacturing costs on gear cases and covers, and to keep bids competitive on subcontract work.

# SEVEN OPERATIONS REDUCED TO TWO!

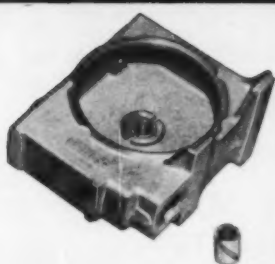


To maintain an acceptable profit margin on their product components as well as keep subcontract bids competitive—much of it on small lot work—General Machine installed a new Warner & Swasey 2AC Single Spindle Chucking Automatic.

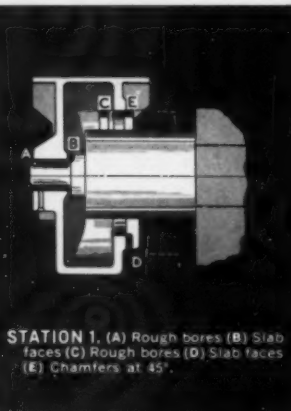
Because of the 2AC's unique over-head turret design, which houses both turret and spindle bearings in the same temperature zone, problems of spindle rise are eliminated. As a result, General's shop people found they could easily hold

single point boring tolerances of .0006 on a day-in-day-out basis.

This repetitive accuracy plus the 2AC's unique versatility and ease of tooling permitted coal stoker gear cases and covers to be machined complete ready for paint in just two operations—one chucking for each part—including pressing-in and finish boring a bronze bushing. Previously seven operations were required—two machining, two arbor press, assembly of cover to case, line ream and disassembly.



Lot sizes range from 100 to 300 pieces on this gear case. Note how radial alignment of bushing is accomplished in STATION 4.



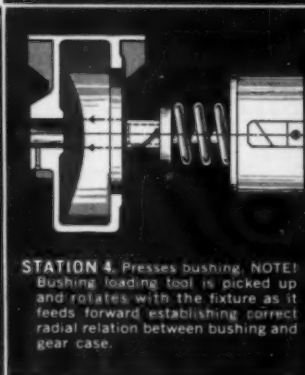
STATION 1. (A) Rough bores (B) Slab faces (C) Rough bores (D) Slab faces (E) Chamfers at 45°.



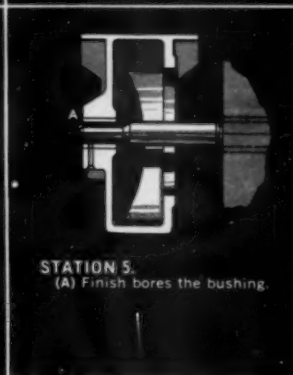
STATION 2. (A) Finish bores (B) Finish faces (late rear cross slide pushes turret mounted slide tool after (A) is completed).



STATION 3. (A) Finish bores (B) Chamfers at 45°.



STATION 4. Presses bushing. NOTE: Bushing loading tool is picked up and rotates with the fixture as it feeds forward establishing correct radial relation between bushing and gear case.



STATION 5. (A) Finish bores the bushing.

You can produce it better, faster, for less  
with a **WARNER & SWASEY**





LEFT: Model 385, with remote hydraulic unit, marks inner and outer surfaces of bearing races at rate of 2000 per hour.



UPPER RIGHT: Model 135-S, with hopper feed and air ejection, is fully automated to mark 1800 to 2400 transistor cans per hour. Marks both top and sides.



LOWER RIGHT: In line Model 465, with serial numbering head, marks date and consecutive serial number on 1200 gear carriers per hour. Equipped with conveyor type fixture.

## BETTER MARKING—LOWER COST MARKING ...WHEN YOU MODERNIZE WITH GTS

Illustrated are typical GTS, *special purpose*, marking machines. Modern GTS machines can deliver a "Sunday punch" to your production marking bottlenecks. Used to *replace obsolete methods*, they can cut your direct production costs. You can have flexibility, *built-in*, to mark more parts—do more marking on parts, with uniform *easy-to-read* impressions.



For sharp impressions and long-run economy, always specify GTS Marking Tools.

GTS machines prolong marking tool life, lowering your tool costs.

GTS experience *can solve* your marking problems. Let our Marking Engineers help you determine the *best methods* for you.

WRITE FOR COMPLETE CATALOG or PHONE EA 7-0300

# GEO. T. SCHMIDT, INC.

1-82 W. Belle Plaine, Chicago 13, Illinois

**IF IT'S WORTH MAKING, IT'S WORTH MARKING**

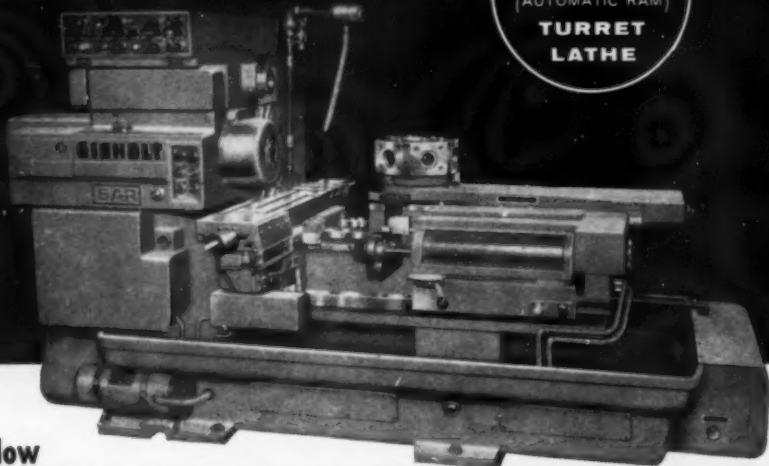
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MACHINE and TOOL BLUE BOOK

# ANNOUNCING

the new GISHOLT



**Now**  
**one machine does both bar and chucking work...automatically**

Here is a ram-type turret lathe "gone automatic." It's the new Gisholt MASTERLINE AR. It handles both bar and chucking work. Changeover takes less than 1 hour. But that's not all. It combines the efficiency and consistent production of an automatic with fast setup and versatility. Yet, the new AR costs very little more than a hand-operated turret lathe!

**For long runs or small lots.** Whether you are now using automatics for long runs, or standard ram-type turret lathes for small lots, you'll want to evaluate this new development in automatics. You will quickly see how the new AR will cut your costs. Based on productivity, capacity, versatility, dependability, ease of operation, setup speed and original cost,

you'll find it's a new best buy for your equipment dollar today!

**Ask for desk-side demonstration.** Your Gisholt Representative will gladly explain the cost-cutting features of the new AR and show you how it can boost profits for you. Ask for your personal, desk-side demonstration or write for literature.



**GISHOLT**  
MACHINE COMPANY

Investigate Gisholt's Extended  
Payment and Leasing Plans

Madison 10, Wisconsin

Turret Lathes • Automatic Lathes • Balancers • Superfinishers •  
Threading Lathes • Factory-Rebuilt Machines with New-Machine Guarantees

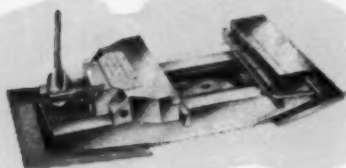
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You get day - in  
with J & S

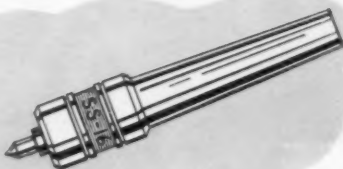
### J & S CLAMPCUT SWIVEL VISE

Highly versatile milling machine vise with all the features which permit faster operation, fewer rejects, more man-hours saved.



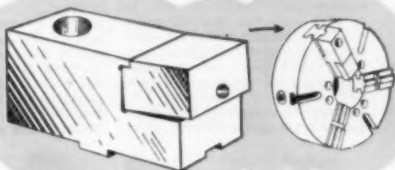
### SUPER SENSITIVE SS-16 LIVE CENTER

For grinders and lathes. Designed to handle the smallest parts with highest precision. Non-friction center is free to rotate at the slightest touch.



### DOWN-HOLDING LATHE CHUCK TOP JAWS

With expendable soft inserts. Cheaper jaws to be used up; thrown away. Provide tighter clamping for parallel machining work. Mount on any American Standard Lathe Chuck Master Jaw.





# day - out economy precision - crafted products

## **J & S CLAMPCUT SWIVEL VISE FOR BETTER MILLING**

With all the features for faster, better milling, this modern swivel vise is available in a complete range of sizes. Low, flat mounting, extra jaw depth, trigger stop for rapid opening and closing, multiple downholding clamp action, self-cleaning snap-on parallels for fast load-unload, plus positive chip escape and coolant return are among the advantages of this versatile J & S Swivel Vise which holds on any angle, holds rounds and allows extra height.

## **SS16, J & S SUPER SENSITIVE LIVE CENTER**

One of the stars of J & S' complete live center line, the SS16 is designed to handle parts with .100" diameter and smaller. It has triple non-rubbing seals and H.S.S. points. The non-friction center rotates at the slightest pressure, is hardened and ground throughout.

## **UNIQUE DOWN-HOLDING LATHE CHUCK TOP JAWS**

These new J & S jaws are another of the forward steps in modern methods of securing workpieces to machine tools. The soft expendable inserts mean cheaper jaws which can be used up and thrown away. They provide more rigidity, accuracy and parallelism; they clamp tightly and hold down a workpiece to a stop for utmost accuracy in machining work parallel.

*Literature and data on request.*

**J & S TOOL CO., INC.**

**882 DORSA AVE., LIVINGSTON, N. J.**

**WYman 2-3181**

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**PRECISION — SPEED — UNIFORMITY**

# **ATLANTIC Pace-Setting JIG-BORERS**



**Model 6000**  
With Built-In  
24" Rotary Table

Modern tool room jig-boring techniques require equipment that is adaptable to a wide range of applications — applications that demand a variety of speeds to guarantee ultimate efficiency and accuracy on every job. The Atlantic Jig-Borers have been designed, engineered and built to deliver every benefit of precision speed . . . and uniformity under exacting, tool room conditions. Jigs, fixtures, molds, dies, gages, special machinery from A to Z, from aluminum to zinc, in every manufacturing process requiring the jig-boring of metal, the Atlantic Jig-Borers offer rugged dependability to micro-tolerances. The ten-thousandths tolerances easily obtained with Atlantic Jig-Borers offer industry an opportunity for precise location and boring at real, money making economy. Many machines costing thousands more do not offer nearly as much. It is the outstanding value in the jig-borer field.

Write for free information and catalog on all available Atlantic Jig-Borers.



**Model 4000**



**Model 5000**



**Model 6000**



**Model 7000**

**5 MODELS AVAILABLE IN TABLE SIZES RANGING FROM 12" x 18" - 24" x 50"**  
**NUMERICAL SYSTEMS AVAILABLE ON 6000 AND 7000 SERIES MACHINES**

**ATLANTIC MACHINE TOOL WORKS**  
**NEWINGTON, CONNECTICUT**

**SEE US AT THE SHOW — BOOTH 543**  
**NATIONAL MACHINE TOOL BUILDERS ASSOCIATION**

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# SAVE DOLLARS ON PRODUCTION



With Engravograph, the illustrated part (spring steel) was profiled, contour milled and drilled in one operation, eliminating expensive tooling, multiple operations on costly equipment.

**MAKE IT IN A FRACTION  
OF THE TIME  
using unskilled  
labor.**

# SAVE DAYS ON DELIVERY



With Engravograph, any nameplate, panel or tag can be engraved right in your own shop, thereby eliminating unnecessary sub-contracting.

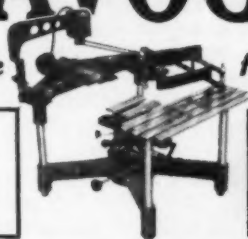
**MAKE IT WHEN  
YOU NEED IT  
using unskilled  
labor.**

# ENGRAVOGRAPH

*the one machine*

*for 1001 jobs*

Write on your  
letterhead for  
28-page catalog MM-4.



***new hermes***

ENGRAVING MACHINE CORP.

154 West 14th Street,  
New York 11, New York



### ***why you get ABC drill jig bushings faster***

**My name is Lou Martz.** It's possible some of you may know me by name—for many of our ABC Bushing customers phone in their orders. That's my job—handling your telephone and mail orders. ● There are several of us at the Accurate order desk. We see to it that your orders are filled fast—and accurately. In many cases, orders are shipped the same day we get them. ● We like our jobs and we like being able to give you better bushings—faster. ● Give us your order, today, and let us prove to you that ABC Drill Jig Bushing service is the best—you'll become an ABC enthusiast, too. ● Write for Catalog B-58.



### **ACCURATE BUSHING COMPANY**

444 North Avenue, Garwood, New Jersey

ASA Standard Drill Bushings • Precision Parts • Lift-Swing Drilling Fixtures

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MACHINE and TOOL BLUE BOOK

# FIRST TIME EVER!

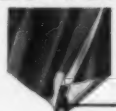
## CONVENTIONAL TWIST DRILL

frequently produces  
long, stringy,  
unmanageable  
chips

END  
VIEW



## "LO-TORK"



CHIPS CURL  
AND BREAK  
INTO SMALL  
PIECES AS THEY  
CONTACT  
"LO-TORK" CHIP  
BREAKER GRIND

PATENT APPLIED FOR

END VIEW



Unretouched photos demonstrate "LO-TORK" Drill's chip breaking effectiveness. Conventional drill at left; "LO-TORK" at right. Same workpiece in each photo.

a chip breaking  
drill that actually  
improves cutting action  
lengthens tool life!

## CHICAGO-LATROBE "LO-TORK" CHIP BREAKER DRILL

The tips on the two drills above show how "LO-TORK" Chip Breaker Drills work. A new convex shape has been engineered into the flutes. Chips meet this shoulder and are reduced instantly to manageable size without sacrificing any of the efficiency of the tool's point. At the same time the tool produces extra benefits as follows:

1. Improved lubrication at drill point.
2. Uninterrupted deep hole drilling.
3. Faster feeds. 4. Longer tool life.
5. New safety for operators.
6. Quick, easy regrinds.
7. Less power required.
8. Improved plant housekeeping.

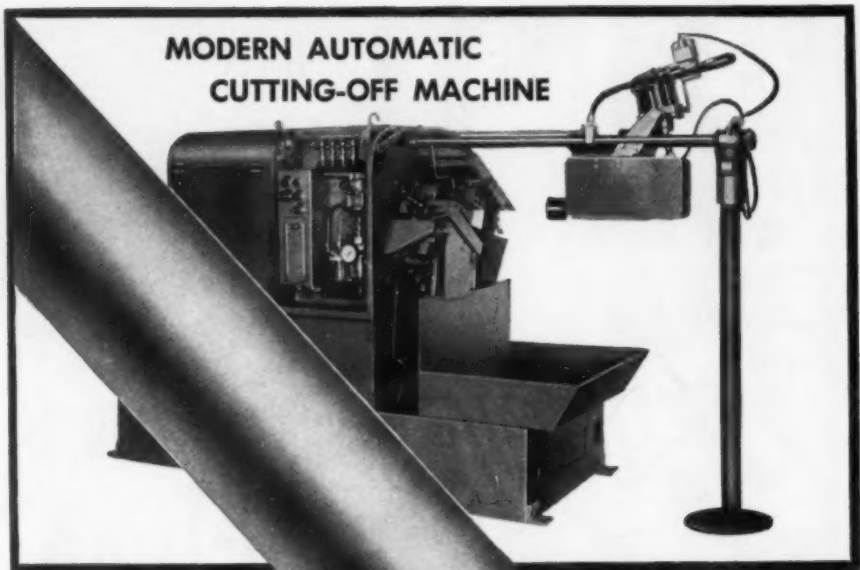
Ask your Distributor  
OR CIRCLE NUMBER FOR FREE BOOKLET.

## CHICAGO-LATROBE

418 West Ontario Street, Chicago 10, Illinois

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## MODERN AUTOMATIC CUTTING-OFF MACHINE



Fast cut-off in lengths from a fraction of an inch to several feet with micrometer accuracy. Handles any length of stock and cuts any material that can be turned—bar stock up to 3" O.D.—tubing up to 8" O.D. Will cut-off, form, groove, flange and chamfer in a single operation—at a high rate of speed.

**CUTS TUBING,  
PIPE AND  
BAR STOCK  
FAST**



### WRITE for CATALOG

Describes all models. Complete specifications. Shows automatic bar feeder that handles entire load of stock with no operator attention, even with random lengths. Also, hot spinning machines and Safety Drill Tables.

103

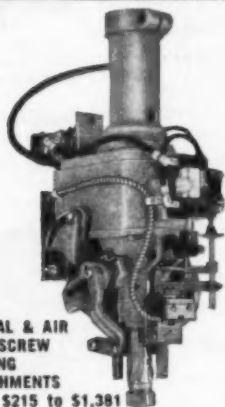
**MODERN MACHINE TOOL COMPANY**  
JACKSON, MICHIGAN

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# HOW TO TAP UP TO 5,000\* SMALL PARTS PER HOUR WITH PRECISION AND AT LOW COST...

## WITH THE JARVIS AIR-OPERATED AUTOMATIC LEADSKRU-MATIC

CHANGE PITCH IN SECONDS WITHOUT CHANGING LEAD SCREW



MANUAL & AIR  
LEAD SCREW  
TAPPING  
ATTACHMENTS  
FROM \$215 to \$1,381

### LEADSKRU-MATIC FEATURES WORTH YOUR INVESTIGATION

1. Adjustable Pitch — Change pitch in seconds without changing lead screw.
2. Exact thread depth control.
3. Forward and Reverse controlled.
4. Cannot break taps or rip threads.
5. 22 separate Pitch Adjustments with 2 models.
6. Longer tap life — Uniform threads.
7. Gives both speed and precision.
8. Accurate lead at all settings.
9. Adjustable stop settings for various depths.
10. Constant production with unskilled operators.
11. Fits any Drill Press.
12. Available with fixed or multiple spindle heads.

**VOLUME PRODUCTION WITH PRECISION.** This Air-Operated, Automatic Lead Screw Tapping Attachment converts your drill press into an extremely accurate tapping machine capable of volume production.

**\*5,000 SMALL PARTS PER HOUR.** Using the LEADSKRU-MATIC as the basic machine, one of our customers built a small parts tapping unit comprising table, hopper feeds, holding fixtures, controls, etc., which taps up to 5,000 nut blanks per hour... **AUTOMATICALLY.** And at a lower cost than less versatile tapping machinery!

**SHORT OR LONG RUN VERSATILITY.** Besides the deluxe, air-operated, adjustable pitch model shown at left, you have, according to your requirements, a choice of electrically driven, manually operated adjustable pitch tapping attachments, or conventional single pitch units. No need to pay for extra features or parts that your jobs do not require.

### JARVIS AUTOMATIC, AIR-OPERATED LEAD SCREW TAPPER ADAPTABLE TO DRILL PRESS TABLE

Where complete automation is not desired, machine is equipped with standard hand-operated model lead screw units.



### SEND COUPON FOR PROMPT DETAILS

To: Jarvis Corporation 40 Pease Ave.,  
Middletown, Connecticut  
☐ Have Rep. call ☐ Send Lead Screw Cat.

Name ..... Title .....

Company .....

Street .....

City & State .....

**Jarvis CORPORATION**

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## Co-form *X-PRESS* TAPS

Manufactured under license from Besly-Weltes Corporation

for tapping threads without cutting

NOW — from HY-PRO you can get the newest in tap design — **Co-form X-PRESS** fluteless taps that are setting cost-reduction records on many jobs that were formerly "tap-killers".

HY-PRO **Co-form X-PRESS** taps cold-form threads in through or blind holes, with these advantages . . .

**No Chips** to clog and cause tap breakage — no chip removal problems • **Permit Faster Tapping Speed** and boost production from automatic equipment • **Provide Accurate Control** of hole size — cannot be forced into lead error • **Eliminate Blind Hole Tapping Problems** — no chips to jam at bottom • **Form Stronger Threads** with better holding power • **Taps Are Stronger** without flutes, especially in smaller sizes • **Taps Last Longer** and maintain accurate size tolerance • **More Holes Per Tap** — up to 40 times greater tap life.

Tap for less with **Co-form X-PRESS**®

® **X-PRESS** is a registered trademark of Besly-Weltes Corporation.

® **Co-form** is a registered trademark of Hy-Pro Tool Company.

### Recommended for tapping . . .

Copper Brass Lead  
Aluminum Zinc  
Steel Magnesium  
Die Castings  
Leadless Steel  
Stainless Steel  
— other ductile metals

### Tapping operation is the same

Conventional methods and equipment are used, except for change to larger tap drill sizes.



## STANDARD TAPS



## FROM STOCK

for "most holes per tap" — in any material



Hand and Machine Screw

Spiral Point

Fluteless  
Spiral Point

Spiral Flute

Special  
Application

Pulley

Acme

Taper Pipe  
Spiral Flute

Straight Flute

Hy-pro Tap Engineering Specialists will help you find out quickly how much you score on "cost per tapped hole." Their job analysis regularly leads to savings of 50% or more — often with a simple switch

to the right style of standard taps. Write for complete information. Find out how much you can save.

For standard taps from stock, call your local Hy-pro Tap Distributor.

# HY-PRO TOOL COMPANY

NEW BEDFORD, MASS., U. S. A.





## You name it . . . we'll stamp it one or a million @ minimum cost

You'll get better service on Stampings from THE LAMINATED SHIM COMPANY. This is literally true because (a) we've been doing it since 1913, and (b) we've perfected our own special equipment, toolings and techniques—all unknown to

the ordinary stampings shop. Therefore you get exactly what you want, including the degree of precision you need—any contour, often without dies—any size—any quantity—fast, and at a surprisingly low cost—according to our

### 1 "ONE PLUS" METHOD

Applies when you need just a few pieces for prototypes or experiment. We hold all critical dimensions, yet avoid tooling charges.

### 2 SHORT RUN METHOD

More than "a few," but less than production quantities. Temporary tooling, simple dies and special presses keep costs down.

### 3 PRODUCTION RUN METHOD

Applies when quantity, tolerance, size and contour factors justify our standard production tooling and/or normal die charges.

### 4 "WATCH DOG" SERVICE

A routine procedure. We re-evaluate repeat orders as to quantity and specs—then use the Method best for you.

Result: lowest possible cost per unit, regardless of quantity. Want more details? And suggestions for ordering Stampings economically? Send for STAMPINGS Folder No. 3—a most helpful reference booklet.



# Stampings

DIVISION • THE LAMINATED SHIM COMPANY, INC.

8606 UNION STREET, GLENBROOK, CONNECTICUT

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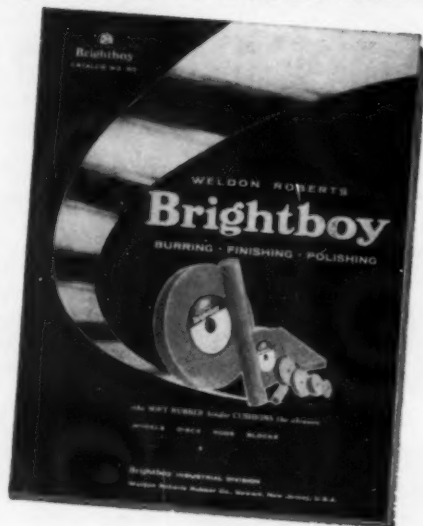
# GET THE NEW, COMPLETE PICTURE

on MULTI-USE, SOFT RUBBER BONDED ABRASIVES  
—THE ONLY COMPLETE, COMPREHENSIVE STOCK LINE!

The revealing, new medium for achieving bigger time savings, improved product quality . . .  
—the revolutionary, new concept of abrasive uses!

*Yours for the asking, the new Brightboy Catalog contains the latest working data, and product listings . . .*

- Brightboy sizes, grains, textures, machine speeds, on all 49 readily available 'Job Matched' stock compounds for machine and manual operations
- new and revised wheel sizes; center hole specifications conforming to American Standards safety specifications
- refreshing, new methods and applications



No plant working in metals, wood, plastics or laminated materials should be without this new reference catalog outlining the exceptional advantages of rubber-cushioned abrasives. Write for it.



BRIGHTBOY INDUSTRIAL DIVISION  
WELDON ROBERTS RUBBER CO.  
95 North 13th Street Newark 7, N. J.

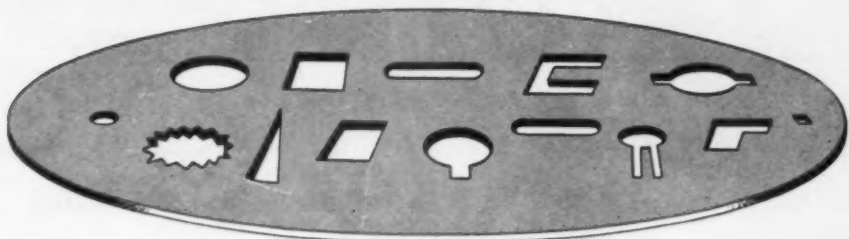


*America's Pioneer Manufacturer of Rubber Bonded Abrasives*

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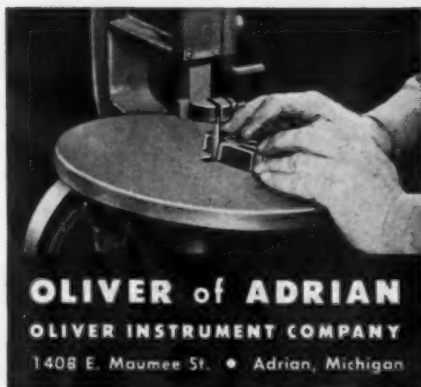
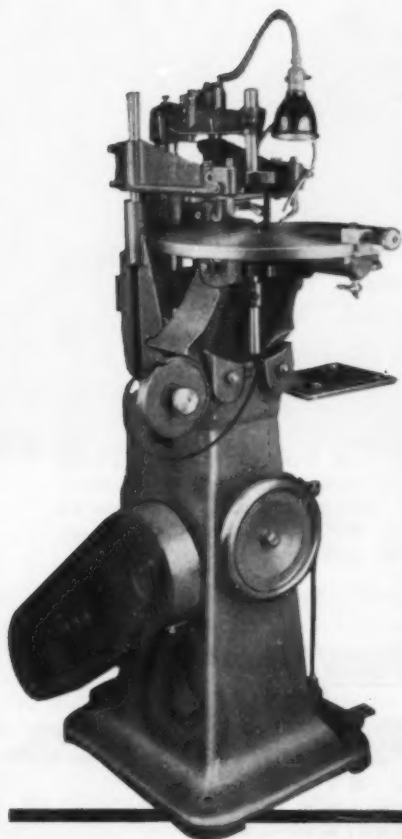
MACHINE and TOOL BLUE BOOK

## FOR CONTOURS LIKE THESE . . .



Freak contours — more conventional shapes — internal or external forms. In any case, you'll save valuable time by producing the job on an Oliver of Adrian contour sawing and filing machine.

Parts for jigs and fixtures, dies, gages, templates and special machine production can be shaped to dimension faster — easier — at less cost. No hand filing or semi-finishing operations. Better investigate Oliver today. Just write. Available in five sizes — bench or pedestal.



**OLIVER of ADRIAN**

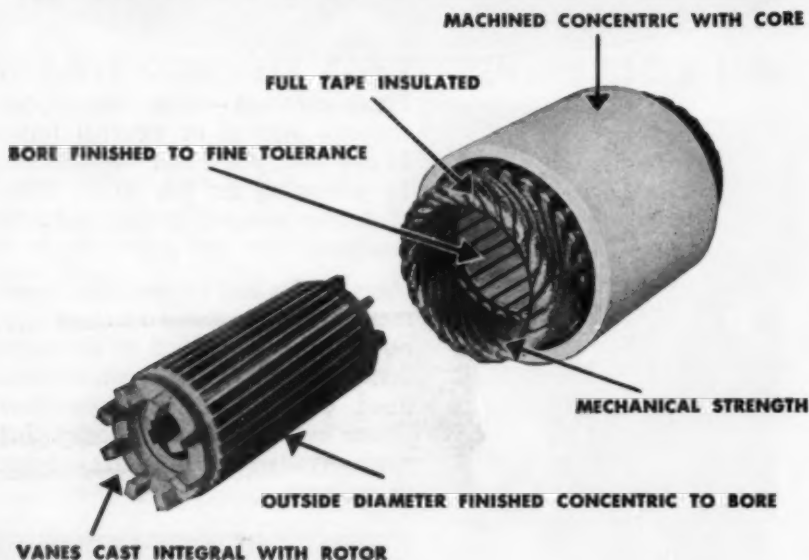
**OLIVER INSTRUMENT COMPANY**

1408 E. Maumee St. • Adrian, Michigan

*Serving the Industry Since 1852*



## WOODS SHAFTLESS MOTORS



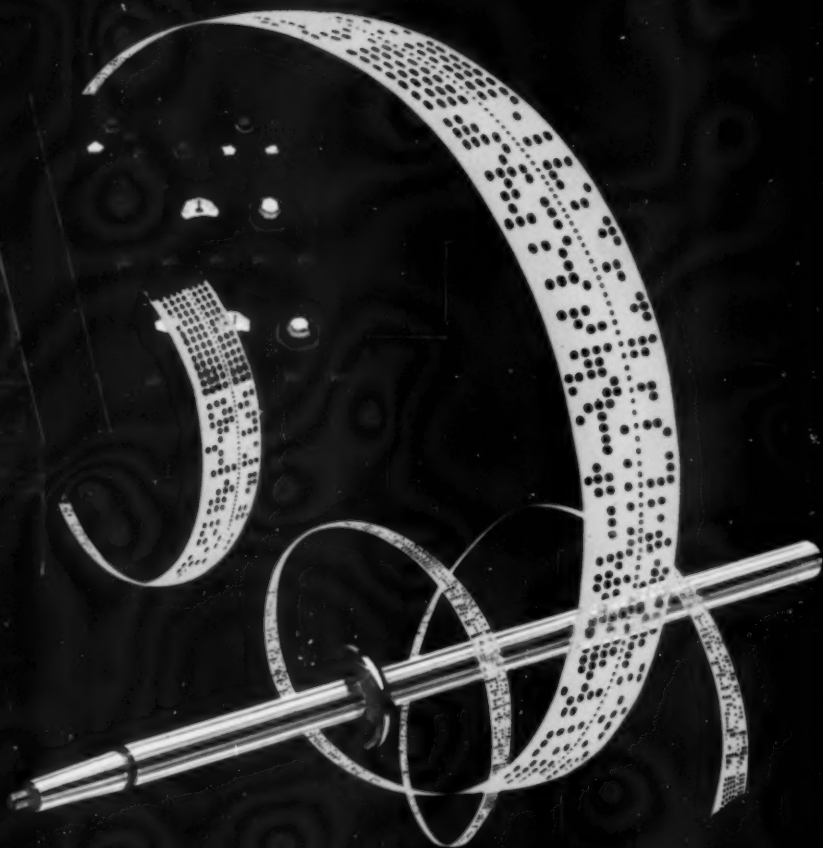
The application of direct motor drive with WOODS' Shaftless Motors to high-speed spindles brings the peak of motive efficiency at relatively small cost. Conserves space—eliminates belts and gears—fewer wearing parts. The extensive and varied lines of WOODS' Shaftless Motors are available for nearly every class of direct application.

Let us tell you how you can achieve a reduction in production costs by direct motor drive.

**MOTOR DIVISION**

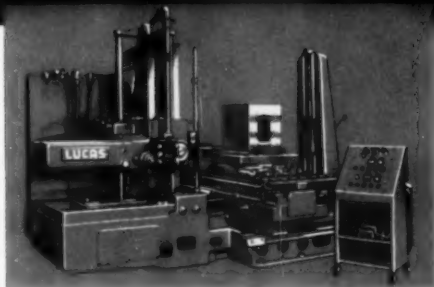
**S. A. WOODS MACHINE CO.**  
27 DAMRELL STREET  
**BOSTON 27, MASS.**

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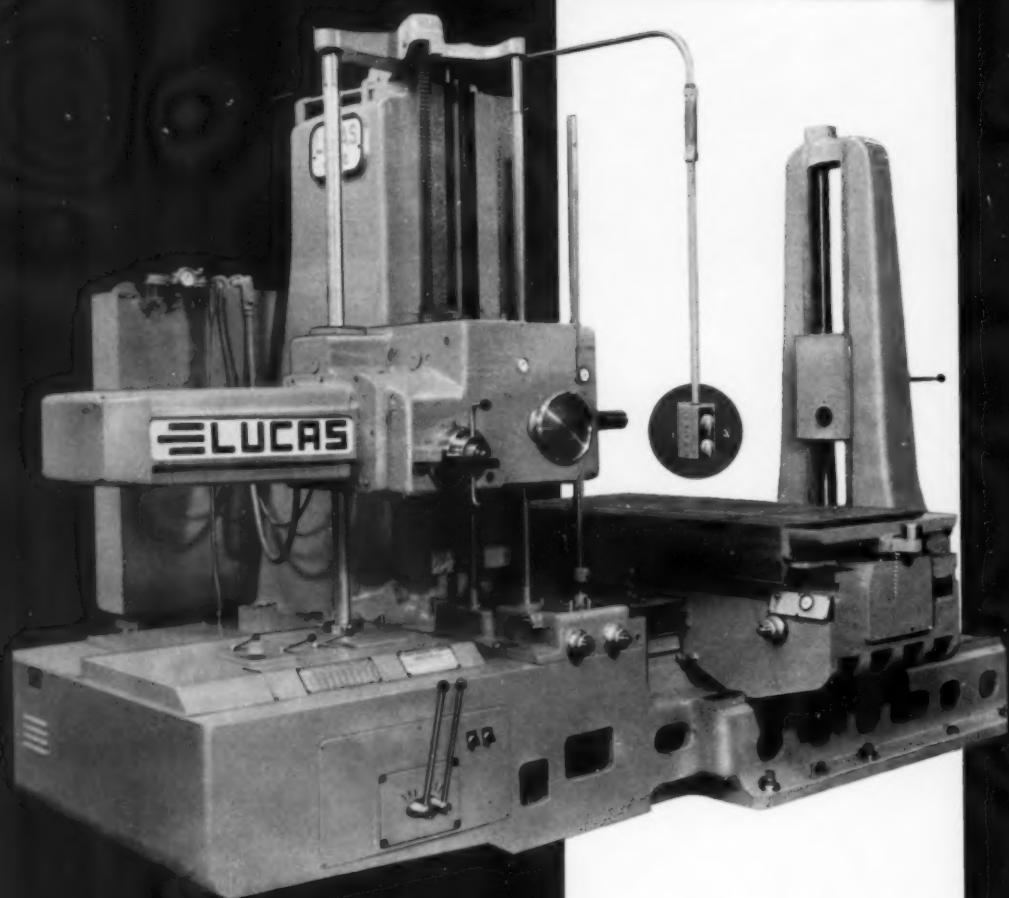


## **Tape control... certainly!**

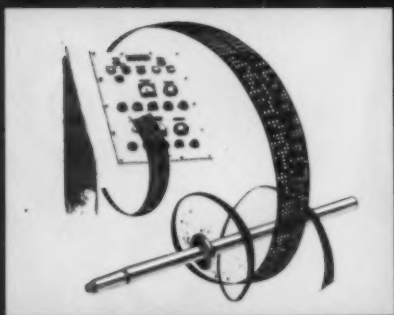
Tape control can readily be applied to any Lucas model, (2-3/4" to 6" diameter spindles) if repetitive operations or complicated one-of-a-kind jobs make this new development advantageous. Lucas tape controlled machines are available with punched tape for N.P.C., magnetic tape for contouring, or tape and tracer control. If you have a profitable use for *any* type or size of horizontal boring, drilling and milling machine (up to 6" spindle capacity) you can get it at its best from the specialist in this type of machine. *Did you ever meet a man who regretted picking a Lucas?*



**LUCAS**  
OF CLEVELAND



## Simplified pendant controls ...



A Lucas performs the greatest variety of operations possible in any machine tool. Standard models permit control of *all* operations from the pendant. Optional pendant and lever control machines, like the one shown above, combine a simplified pendant with readily accessible levers. Whichever type of control you want—pendant, lever, tape, tracer or any of these in combination—Lucas has it.

**LUCAS**  
OF CLEVELAND





# 90 STANDARD SIZES

## in a Custom-Quality Press

Take your choice of dependable Danly SC crankshaft presses in capacities from 50 to 300 tons...bed areas to 72" x 60"...with strokes to 16"...constant or variable speeds to 90 SPM...with non-gear, single or double-gear drives...equipped for manual or automatic feed.

Every SC press gives you Danly's patented low-maintenance air-friction

clutch, husky welded-steel frame, and countless other custom-quality features.

For low-cost piece part production...in blanking, drawing, piercing, forming, or progressive die stamping...you'll find your choice of Danly SC Presses ahead of the field and best for you. WRITE FOR NEW SC CATALOG and get all the details.



# DANLY



DANLY MACHINE SPECIALTIES, INC., 2100 S. LARAMIE AVE., CHICAGO 50, ILLINOIS

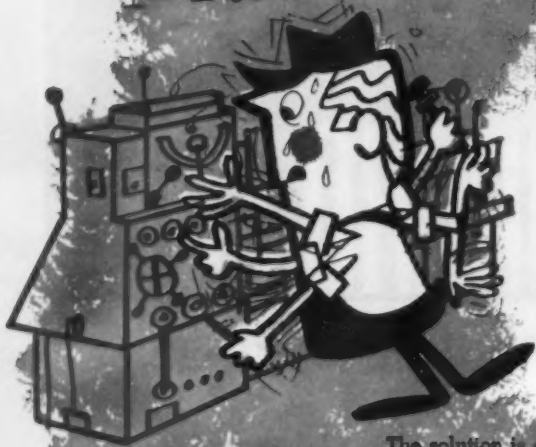
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# STOP

these men  
from  
stealing your  
profits.....

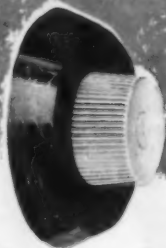


You know about this fellow . . .  
he's stealing "cash", and you  
do try to stop him.

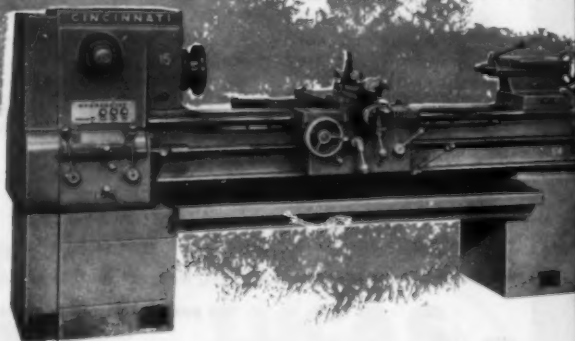


But **YOU** cause this theft . . .  
you force this man to  
steal your profits . . .  
make him add to labor and  
burden costs on most lathe  
jobs, no matter how hard  
he works.

The solution is easy:  
make your operator a **cost-reducer** on **ALL** of his lathe  
jobs—shift him to **HYDRASHIFT®**. Here's why . . . . .



\*HYDRASHIFT is Cincinnati's  
new lathe line with the new  
way to change spindle speeds  
... hydraulically!



Compare the machining of this typical lathe job,  
two steps  
and two necks  
on the new HYDRASHIFT . . . on a conventional lathe



As second step is being cut, operator turns the dial to speed required for the necking cut.



Operator waits for machine to complete the step cuts.



Step cuts completed, operator changes to necking tool (he had it lying on the convenient Tray-Top) and positions tool for cut.



Step cuts completed, operator changes to necking tool and positions tool for cut.



Operator engages spindle lever and cuts the neck—without leaving apron.



Operator goes to headstock, shifts various levers to change to spindle speed for necking cut.



Necking cuts completed, operator changes tools for next workpiece.



Operator returns to apron, engages spindle lever, and cuts the neck.

Don't force your lathe operators to steal profits from your pockets—take a look at the new Cincinnati HYDRASHIFT Lathes at your nearby Cincinnati Lathe and Tool Dealer's showroom. If you can't reach him immediately, wire collect!

CINCINNATI LATHE AND TOOL CO. CINCINNATI 9, OHIO

HYDRASHIFT Lathes/CINCINNATI Drilling Machines/SPIROPOINT Drill Sharpeners



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## HOUR OF DECISION

**After hours? — sure** You're not surprised at that because you know it's when he (and probably you, too) concentrates on the problems which are vital to his company's continued successful growth. The day is filled with production crises, maintenance problems, personnel questions, and committee meetings. It's only now that he can really study the facts and decide what's best.

Right now he's reviewing his machine tool inventory. He's amazed at how old some of his equipment is getting to be. It seems only yesterday that he signed the purchase order for it to increase his capacity for World War II. But that was 1943, seventeen years ago! No wonder maintenance is getting high and efficiency is dropping off.

We've got a suggestion for this man (and for you, too). Attend **THE MACHINE TOOL EXPOSITION — 1960** and see for yourself why Modern Machine Tools = Production Efficiency. This exhibit, the first since 1955, is sponsored by The National Machine Tool Builders' Association\* and will contain eleven acres of the U.S.A.'s newest machine tools under power, cutting and forming metal to demonstrate 1001 ways to lower production costs. Can you afford to stay home?

You're also invited to the **PRODUCTION ENGINEERING SHOW** on the Navy Pier. No extra registration needed.

\*The N.M.T.B.A. represents 90% of the U.S.A. machine tool industry.

FORMULA FOR TOMORROW



International  
Amphitheatre  
Chicago, Illinois  
Sept. 6-16

# THE MACHINE TOOL EXPOSITION — 1960

For information write to

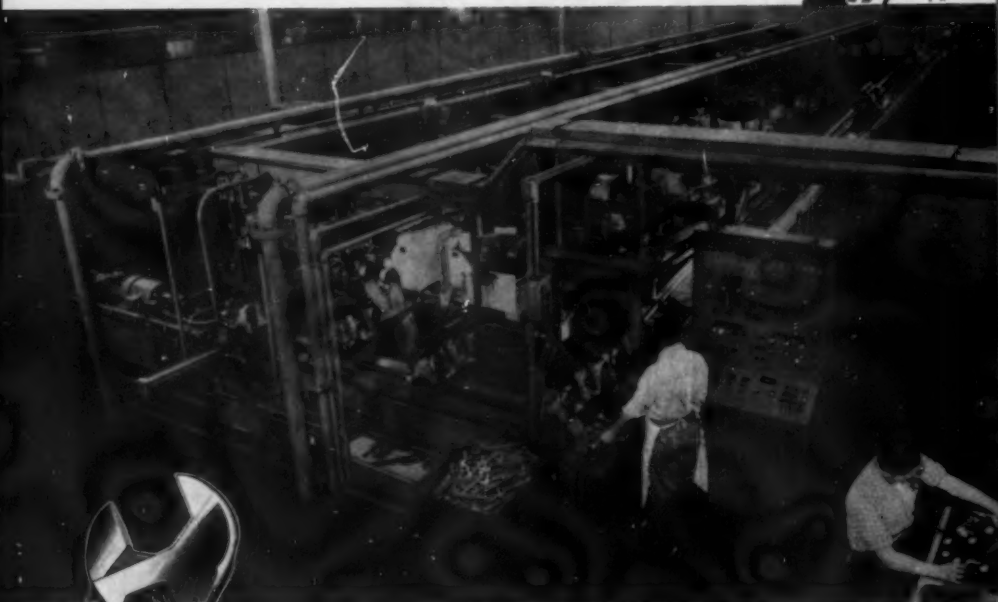
**NATIONAL MACHINE TOOL BUILDERS ASSOCIATION**

2139 Wisconsin Avenue, N.W. • Washington, D. C.

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# It's a Push-Button World at WILLIAMS

that's why **SUPERJUSTABLES®**  
**WORK BETTER • LAST LONGER**



● **AUTOMATED MACHINING** guarantees smooth adjustment, exact fit in every wrench. This million dollar transfer machine was designed especially for Williams' Superjustable® wrench production. A push of a button puts 28 stations in operation...consistently machining to uniformly close tolerances. Fully machined wrench heads are constantly checked on special gauges to further insure perfect fit with sliding jaws, worms, pins and springs. No other manufacturer has this automated equipment to so precisely machine wrenches that *work better...last longer.*



Send for New Catalog No. 304. Lists over 4530 Stock Wrenches, Tools and Forgings...the Broadest Line of its kind.



**J. H. WILLIAMS & CO.**

DIVISION OF UNITED-GREENFIELD CORPORATION  
418 VULCAN STREET • BUFFALO 7, NEW YORK

**TOOLS of INDUSTRY**

*Superjustables® are available in regular or locking styles in sizes ranging from 4 to 24 inches, Black or Chrome finish.*

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FOR  
A REAL GRIP  
USE  
**UNIVERSAL  
COLLET  
CHUCKS**



A sure, solid grip on tools is provided by the wrap-around action of Universal chucks because the slotted collet grips the tool on a continuous surface the full length of the collet. Tools can't slip and tool shanks

don't get scored. Even tool stubs and broken drills can be used successfully. Sizes range from  $\frac{1}{16}$ " to  $1\frac{1}{2}$ ", with shanks to fit any machine. Simplified design results in low chuck cost to you. Write today for new "complete line" catalog.



**UNIVERSAL ENGINEERING CO.** FRANKENMUTH 10 MICHIGAN

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# Table indexes clockwise, work fixtures counterclockwise for 6 holes 60° apart

## *Kingsbury machine drills and counterbores 135 steel forgings per hour gross*

**Problem:** C'bore and drill six angular holes 60° apart in a forged steel gear.

**Solution:** Six drilling units with two-spindle heads are mounted on angular columns 60° apart on a circular base. An index table holds 12 work fixtures that do not turn with reference to any fixed point. As the table indexes clockwise 30°, each fixture indexes 30° counterclockwise. The work remains clamped as it indexes.

Each unit operates two tools downhill at a 27° angle. The first tool counterbores .1562 diam. at one station for an accurate start. The second drills .0937 diam. through at the next station. The operator changes parts in his fixture while the units perform their automatic cycles. Two tools operate at the same time on the part at the rear station.

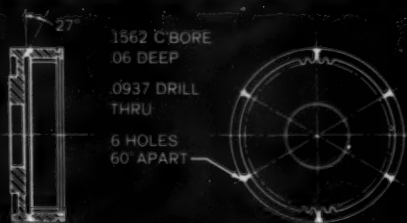
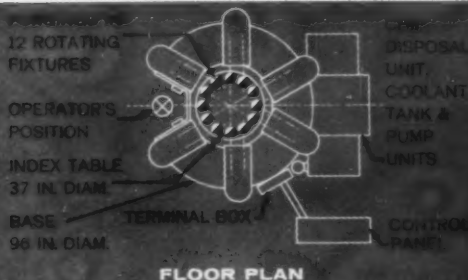
**Uniform Parts that Gage** Maybe this seems simple. But it takes some doing to . . .

- build 12 fixtures that are exact duplicates, each one to hold the work firmly and accurately;
- remove backlash from the gears that index the fixtures;
- start angular holes straight and in exact position.

We specialize in solving such problems. Our machines have good basic design and accurate rugged construction to produce uniform parts that gage.

May we make you a proposal? You can then place one order for the entire machine and make us fully responsible that it meets your specifications. Kingsbury Machine Tool Corp., Keene, New Hampshire.

**KINGSBURY** MULTI-UNIT  
AUTOMATICS



FORGED STEEL GEAR FOR TRANSMISSION



*No Finer Instruments Made*

## STARRETT PRECISION LEVELS



**STARRETT No. 199  
MASTER PRECISION LEVEL**

Ground and graduated main vial sensitive to variations of 0.0005" per foot. Special alloy, seasoned base has insulated top plate. Length 15".



**No. 97 — No. 98 Series  
MECHANICS LEVELS**

No. 97 with plain, No. 98 with ground and graduated main vial; also cross test and plumb vials. Base grooved with special involute design for flat or cylindrical work. 4, 6, 9, 12, or 18-inch sizes.

Starrett Levels are designed to assure precision operation of the machines you build as well as the machines you operate. They belong in every erecting department, toolroom and production shop. Ask your Industrial Supply Distributor or send for Starrett Catalog No. 27 describing the complete line. Address Dept. B

# Starrett®

*World's Greatest Toolmakers*

## PRECISION TOOLS

The L. S. STARRETT COMPANY • Athol, Massachusetts, U. S. A.

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**The blades  
that outlast  
all others!**

**A RADICALLY NEW METALLURGICAL APPROACH** builds unprecedented durability into Heller "Ultra". That's why they're certain to outlast all high speed steel band saws currently used in production cut-off work on ferrous metals. **IMPROVED IN EVERY WAY!** Special steel analysis . . . more advanced production methods . . . closer heat-treating control . . . stronger welds . . . more exacting 100% inspection! No wonder Heller "Ultra" deliver up to 300% more cuts per blade. Yet, the price is only 10% higher. This means as much as 75% savings in cutting costs. **TESTS CONFIRM THEIR SUPERIORITY!** Matched against all comers, at heavy feeds and higher speeds, the harder teeth, tougher bodies and more uniform full-blade flexibility of Heller "Ultra" are sure bets to win the race against time and costs. Seeing's believing!

# Heller

"ULTRA"  
HIGH SPEED STEEL  
*metal cutting*  
**BAND SAWS**

**TAKE THE  
GAMBLE  
OUT OF  
BUYING!**

An early order for welded-to-length, protectively packaged Heller Ultra High Speed Steel Band Saws from your nearby Heller Distributor is the wisest and safest bet you'll ever make. Prompt delivery is also guaranteed!



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America's Oldest File Manufacturer  
**NEWCOMERTOWN, OHIO**  
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June, 1960

41

# NIAGARA PRESS BRAKES

## *hottest line today*

... way out front  
in production-boosting,  
cost-cutting features ...  
highest dollar value of all

Hottest line in the industry, more  
Niagara Press Brakes are being bought  
today than ever before.

What's behind it? **Performance!**  
Downright, measurable, press brake  
performance! High hourly output with  
minimum operator effort is setting  
new work standards in plant after plant.

How about you? Want to sail  
through your schedules at  
record-breaking speed ... cut your  
operating and maintenance costs to  
the bone ... hold your capital investment  
to a **practical minimum ... then**  
**Niagara is the press brake for you.**

Talk it over with a Niagara  
sales engineer. He has the facts  
to give you a fair comparison  
... on every point.

### 77 sizes to choose from

- 15-1500 tons
- Power or Manual Clutch
- Smooth, micro-inching ram
- Wear resistant, non-metallic ways
- Gebring enclosed in sealed oil bath

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DISTRICT OFFICES: Boston • Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia  
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You can do more with

**DELTA**

## Cuts drilling time by 60%



Delta 15" Drill Press, also 20", 17", 14" and 14" Super-Hi Sensitive. Available in floor, bench, and multiple spindle models.

This substantial reduction in drilling time is the result of ingenuity plus a combination of Delta drill presses in two and three spindle set-ups. Spacing machines at a specified distance between holes and using bar connecting operating levers, Capitol Products Company provides *simultaneous* drilling in production of aluminum storm doors. The Mechanicsburg, Pa. firm has standardized on Delta drill presses because these tools assure the adaptability, ruggedness, and accuracy required. In addition, maintenance and servicing are greatly simplified.

Visit your Delta Industrial Distributor (listed under "TOOLS" or "MACHINERY" in the Yellow Pages)—choose the tool to fit *your* needs from the world's most complete line. For FREE Delta Industrial Catalog showing 61 machines, 302 models, over 1400 accessories, write: Rockwell Manufacturing Co., Delta Power Tool Division, 610F N. Lexington Ave., Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Co. of Canada, Ltd., Box 420, Guelph, Ont.

DELTA INDUSTRIAL TOOLS

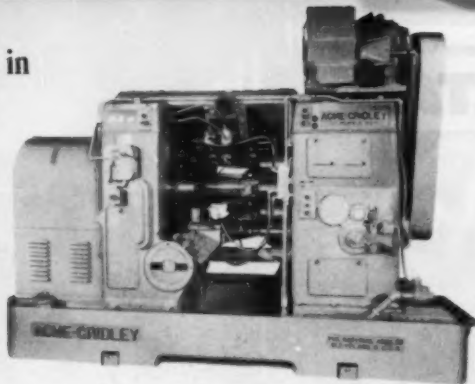
another fine product by

**ROCKWELL**



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Major breakthrough in  
shaft production...



## Acme-Gridley multiple-spindle shaft machine equals output of four automated lathes

At Chrysler Corporation's Trenton, Michigan, Engine Plant, a remarkable new National Acme shaft turning machine has slashed camshaft production costs; is hailed as a major production development for the entire industry. Performing complete shaft journal machining in a single set-up, this rugged 6-spindle automatic provides substantial savings in floor space and capital outlay, reduces scrap loss and enables closer control of machining operations.

Key to this dramatic pay-off are imaginative National Acme solutions to the difficult problems of centering, driving, and stabilizing the long, flexible shaft during turning operations. An ingenious part-holding technique exposes bearing journals for turning—an impossibility in a chucking set-up.

Extreme capability is stressed in the design of the Universal Multiple-Spindle Shaft Turning Machine and permits the maximum number of machining operations to be performed on straight or flanged shafts held between centers.

The shaft turning machine is additional evidence of National Acme know-how applied to the solution of special machining problems. This same insight and ability is available to any manufacturer interested in reduced costs and increased production. Our representative is as close as your telephone.

**National Acme's "Zone of Responsibility" includes all phases of cost reduction. Check YOURS . . . Then Check National Acme**

**Direct Costs:** these include direct dollar savings as realized by Chrysler Corporation . . . an "everyday" job for Acme-Gridleys. **Indirect Costs:** effecting important savings in maintenance, downtime, scrap reduction, tool costs, etc. **Product Redesign:** teaming with your design group to take full advantage of Acme-Gridleys' cost reducing capabilities. **Direct Material Costs:** our engineers provide important savings in this area by constantly matching machines and tools to modern metallurgical problems. **Make-or-Buy Reviews:** in many cases our Contract Division can assume your production headaches and relieve you of immediate capital investment. **Spot Modernization:** pioneering in modern tooling methods, and the flexibility of Acme-Gridleys can provide many "on-the-spot" savings.



**National  
Acme**

The National  
Acme Company  
177 E. 131st Street  
Cleveland 8, Ohio

Sales Offices: Newark 2, N.J.; Chicago 6, Ill.; Detroit 27, Mich.



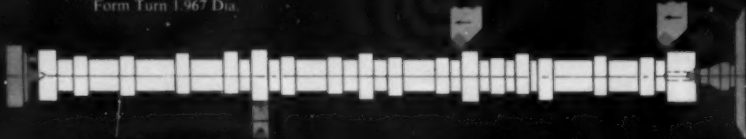
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1st position—load and unload



2. Form Turn 1.951 Dia.  
Form Turn 1.967 Dia.



3. Form Turn 1.982 Dia.  
Form Turn 1.998 Dia.  
Support on 1.967 Dia.



4. Chamfer O.D. of 1.951 Dia.  
Chamfer O.D. of 1.967 Dia.  
Face Sides of 1.743 Dia.  
Support on 1.967 Dia.



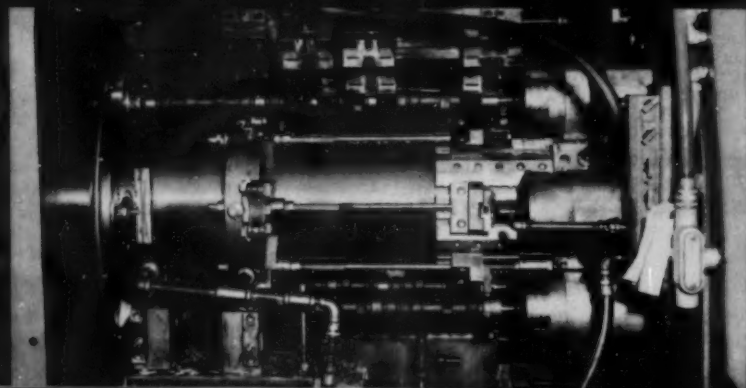
5. Face End of Camshaft  
Relieve Turn 1.743 Gear Dia.  
Support on 1.967 Dia.



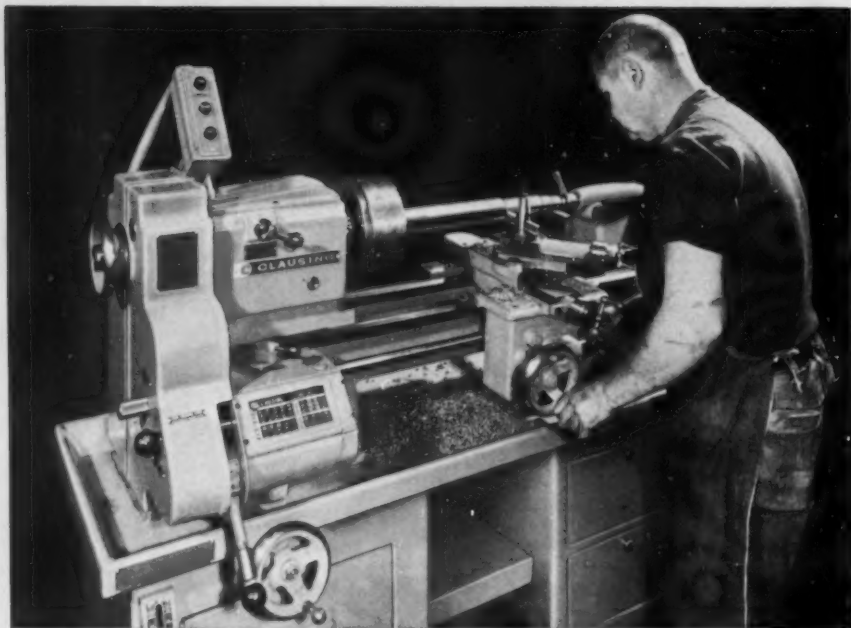
6. Chamfer O.D. of 1.743 Dia.  
Chamfer O.D. of 1.982 Dia.  
Chamfer O.D. of 1.998 Dia.  
Support on 1.967 Dia.



High-test cast iron camshaft with journal machining completed.  
13 operations in 22 seconds.



Close-up of tooling zone.  
Open spindle in load and  
unload position shows  
unique centering, holding  
and driving mechanism.



## Now ... crown-shaved gears standard equipment on Clausing 12 $\frac{3}{4}$ " lathes!

All gears on Clausing lathes are crown-shaved for quieter, smoother operation and greater accuracy than ever before. It's another PLUS feature that makes Clausing truly outstanding among lathes in its class. Here are a few of the many more—

- (1) Flame-hardened bed ways standard equipment.
- (2) Heavier throughout—"have more guts than most of our machines costing 3 or 4 times as much."
- (3) Forged steel spindle, with L-00 or 2 $\frac{1}{4}$ "-8 threaded nose.
- (4) "Zero Precision" Timken tapered roller bearings.
- (5) Choice of heavy-duty variable speed or 10-speed countershaft, with clutch and brake optional.

- (6) Verified precision—factory test report accompanies each lathe.

The result . . . this user report is typical of the performance and value you get in Clausing lathes: "After investigating the lathe field very thoroughly our choice was Clausing, and subsequent performance exceeded our expectations. We recommend the Clausing 6300 series lathes as the competition-beating answer in their capacity range."

See Clausing before you buy any lathe of comparable size. See for yourself why Clausing is acclaimed *the* outstanding lathe value.

Write FOR ILLUSTRATED CATALOG TODAY



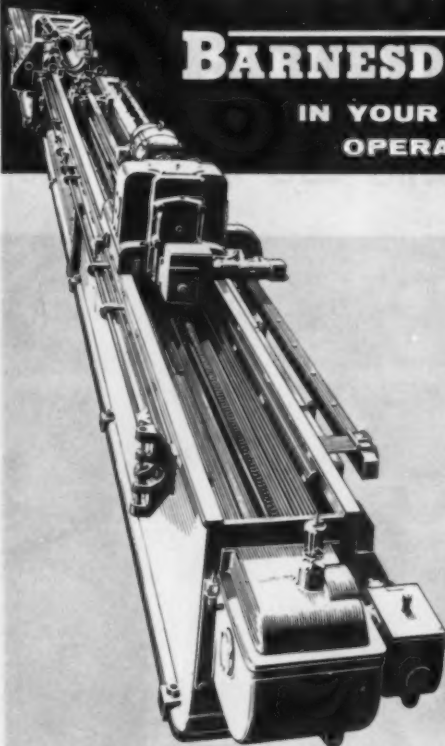
**CLAUSING DIVISION**

ATLAS PRESS COMPANY

6-107 N. PITCHER ST. • KALAMAZOO, MICH.

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CONSIDER THE ADVANTAGES OF  
**BARNESDRIL HONING**  
 IN YOUR MACHINING  
 OPERATIONS . . .



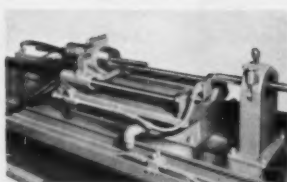
● Fast, accurate, economical metal removal to tolerances measured in tenths of thousandths . . . uniform finishes from 1 to 100 RMS . . . at production speeds. Barnesdril Honing Machines combine the advantages of geometric accuracy — axial straightness, diametric roundness, and diametric straightness — with metal removal rates comparable to grinding operations. Compensation for stone wear, rapid tool expansion, hone feed, and tool collapse have been integrated as part of the machine function . . . all blended into smooth, fast-reversal stroking by Barnesdril's exactly engineered hydraulic drive system.

Barnesdril Horizontal Honing machines range in size from Model No. 1 with capacity to 11' length to Model No. 36 for lengths up to 90'. Large capacities and fast metal removal rates make these machines ideal for honing commercial tubing. An additional Barnesdril feature . . . short stroking at any point in the bore . . . insures a uniform bore size. Electric hone expansion provides continuous control of pressure and automatically compensates for stone wear.

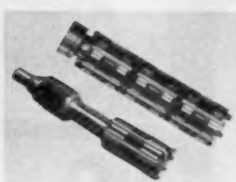
For fast, accurate metal removal . . . consider honing. And, by all means, consider Barnesdril. We offer a complete line of Vertical and Horizontal machines in a wide range of sizes for internal or external honing. Write for catalog No. 580 TODAY!



CENTRAL  
CONTROL PANEL



EXCLUSIVE PLUGMATIC  
GAUGING MECHANISM



COMPLETE LINE  
OF HONING TOOLS

**BARNESDRIL**

HONING MACHINES



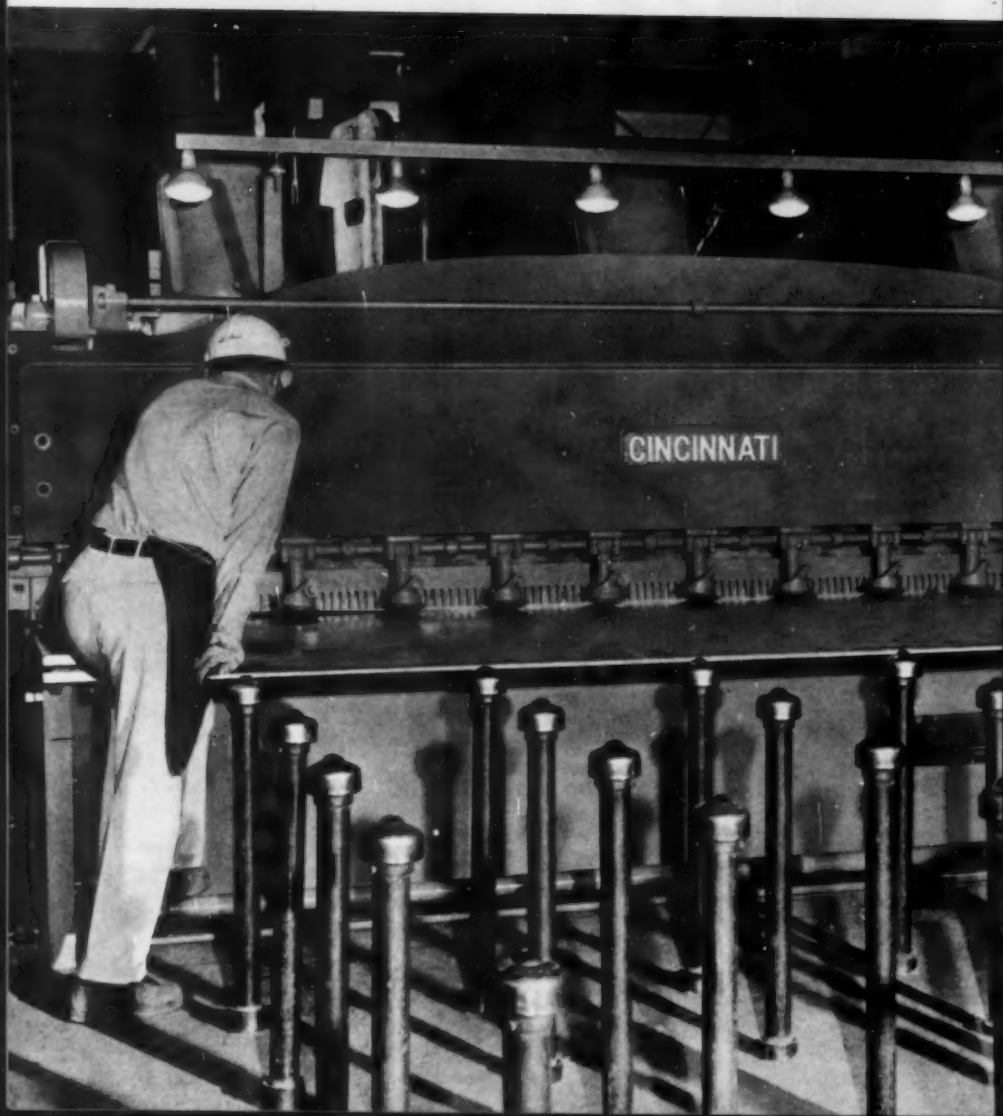
Honing Machines / Production Units / Filtration Units / Drilling Machines

**BARNES DRILL CO.**

852 Chestnut Street • Rockford, Illinois  
 DETROIT OFFICE — 13121 Puritan Avenue

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# Maintenance



# negligible

## ON 6 YEAR OLD CINCINNATI® SHEAR



"We have had this Cincinnati Shear in almost constant operation for something over six years," says S. L. Cate of Bannock Steel Company, Pocatello, Idaho, "and, to date, our maintenance costs have been almost negligible."

"We certainly feel that this is truly a remarkable performance."

Bannock Steel Company recently installed a new Cincinnati Hydraulic Press Brake—clear evidence of their confidence in the Cincinnati line.

See our insert in Sweet's Machine Tool file.

*Courtesy Bannock Steel Company*

Shapers / Shears / Press Brakes

THE **CINCINNATI**  
**SHAPER** co.



Cincinnati 11, Ohio, U.S.A.

In Scotland: The Cincinnati Shaper Co., Ltd., Glasgow

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## BENDING CIRCLES ?



Pedrick Production Benders travel in the best circles—and produce from pipe, tubing or structural metal the best circles or any other type of bend—faster, more economically.

**PEDRICK TOOL AND MACHINE CO.**  
3640 N. Lawrence St.  
Phila. 40, Pa., Dept. 3.



“Select your proper bending machine from the  
NEW PEDRICK LINE BULLETIN. Ask for it now.”

# BEND WITH PEDRICK

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MACHINE and TOOL BLUE BOOK



Packaging Corporation of America:

## "Would Make The Same Choice Again"

LODGE & SHIPLEY  
POWERTURN

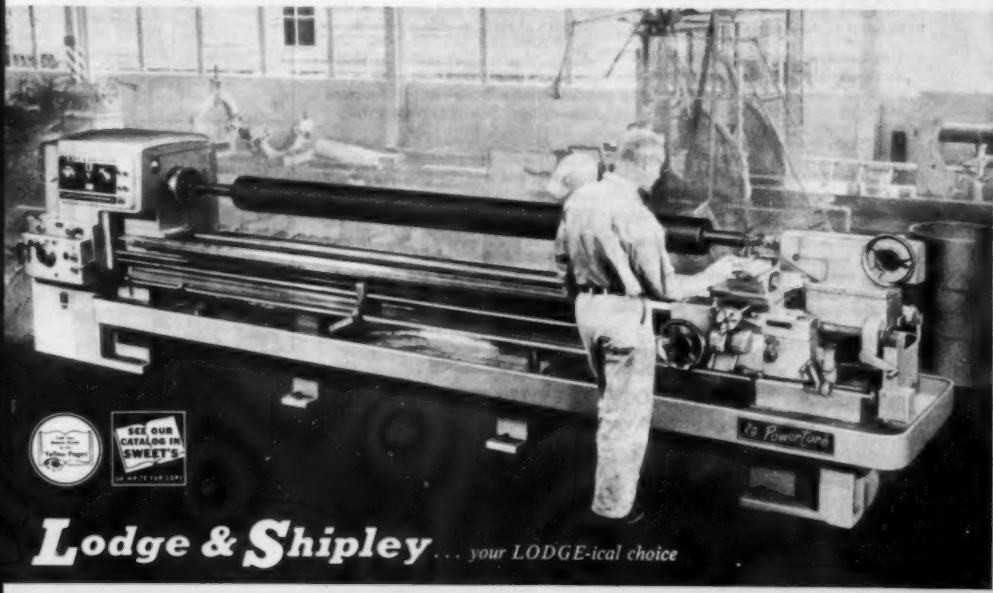
POWERTURN fits perfectly in the shop requiring the utmost in engine lathe performance. It pays its way every day with genuine versatility, giving accuracy in a wide selection of feeds and speeds required for a multiplicity of jobs.

Here's proof . . . in an installation at Packaging Corporation of America's Filer City (Mich.) Mill, where the shop foreman comments: "Every type of work is within the capabilities of this lathe" . . . "its accuracy is excellent, meets our most rigid requirements."

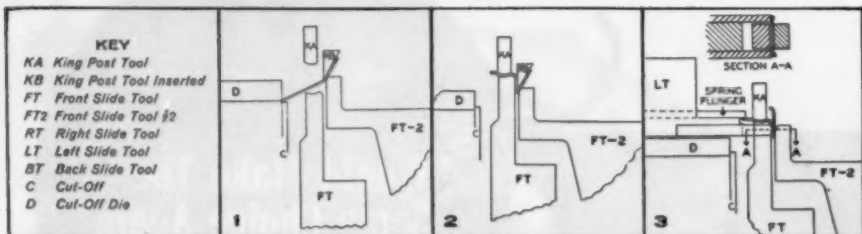
The POWERTURN Engine Lathe combines power and stamina with the most up-to-date features for precision and operating convenience . . . the qualities which have characterized Lodge & Shipley's 62-year history of users who "would make the same choice every time."

Whatever your turning requirements, consider Lodge & Shipley lathes: the best machine for a specific job or the greatest versatility for many jobs.

Write: Lodge & Shipley, Dept. L-107,  
3074 Colerain Ave., Cincinnati 25, Ohio.

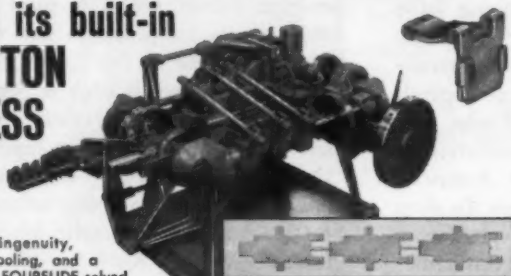


**Lodge & Shipley** . . . your LODGE-ical choice



# JOB SHOP MAKES COMPLEX PIECE IN ONE OPERATION

on a **NILSON S-3-F FOURSLIDE**  
with its built-in  
**20 TON**  
**PRESS**



Design, ingenuity, simple tooling, and a **NILSON FOURSLIDE** solved this tough problem for Dayton Coil Spring Company, Dayton, Ohio. They put this job on a **NILSON S-3-F** for speed and economy of tooling, instead of in their stamping department.

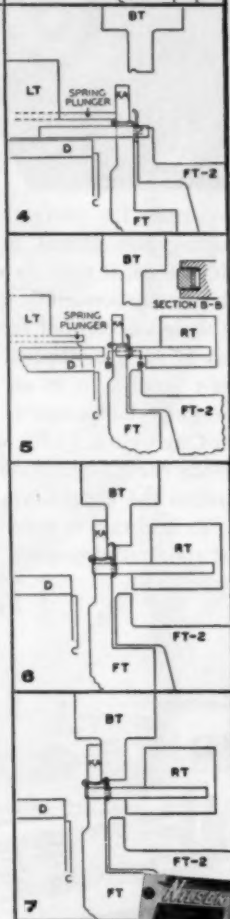
They benefited first by getting into production faster than possible with complicated cams and progressive dies necessary to do the same job. Second, even though the part is complex, the **FOURSLIDE** tooling is simple and comparatively inexpensive. Third, the entire piece is formed completely in one machine, resulting in equipment and manpower savings.

The built-in 20 Ton Press produces blanks, from .025" x 1.125" cold rolled ribbon steel, which are continuously fed into the **FOURSLIDE** tooling area, where the first blank is cut off from the one

following. (See Tooling Step #1). After the 6 additional steps shown here, the piece is completed and ejected. **SEVEN MODELS** of **NILSON** ribbon metal forming **FOURSLIDES** are available with various speed ranges between 32 to 204 parts per minute, stock widths up to 3½ inches, and with built-in press sections ranging from 5 to 75 tons capacity.

Many of these production savings can be yours when you consider every metal stamping and wire forming job as an opportunity to save time and dollars with a **NILSON FOURSLIDE MACHINE**.

Remember — it's usually simpler to tool a **FOURSLIDE**, it's certainly faster, the economy is startling, and you'll do stamping jobs in one operation that you didn't think could be done.



## NILSON

**A. H. NILSON MACHINE CO.**  
626 Bridgeport Avenue • Shelton, Conn.

Write today for the **NILSON**  
**FOURSLIDE** Catalog No. 62.



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**DEPENDABLE . . . predictable response to  
heat treatment every time**



Send for Bulletin 102—  
"Helpful Heat-Treating  
Hints."

The full uniformity within each bar of Desegatized FM die steel and the consistent uniformity from lot to lot simplifies the heat treatment of your die components. Predictable hardnesses are readily attainable . . . distortion and size change are minimized . . . danger of cracking is lessened!

In free machining FM die steels, full uniformity is achieved through Latrobe's unique Desegatized process of manufacture. This process guarantees an even distribution of carbide particles, free machining alloy sulphides and other alloying elements . . . factors leading to improved machinability, greater toughness and improved wear resistance in addition to the optimum heat-treating characteristics.

Latrobe's 12% chromium FM die steels are available through district steel service centers near you. Grades include: Olympic FM (Type D-2) for long-run applications; GSN FM (Type D-3) non-deforming die steel; Cobalt Chrome FM (Type D-5) for extra resistance to galling and pickup.

Call your Latrobe representative today!

Manufactured  
by skilled  
American  
labor

LATROBE



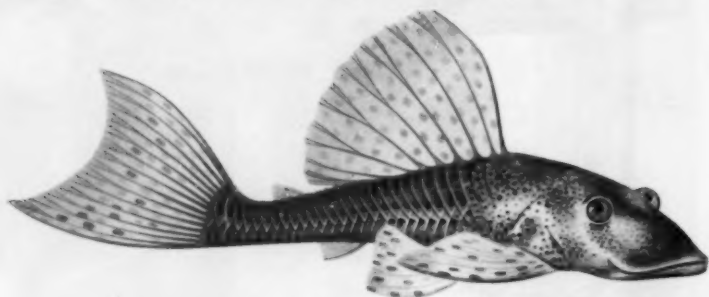
Metals

**LATROBE STEEL COMPANY**  
**LATROBE, PENNSYLVANIA**

BRANCH OFFICES and STEEL SERVICE CENTERS: BOSTON • BUFFALO • CHICAGO  
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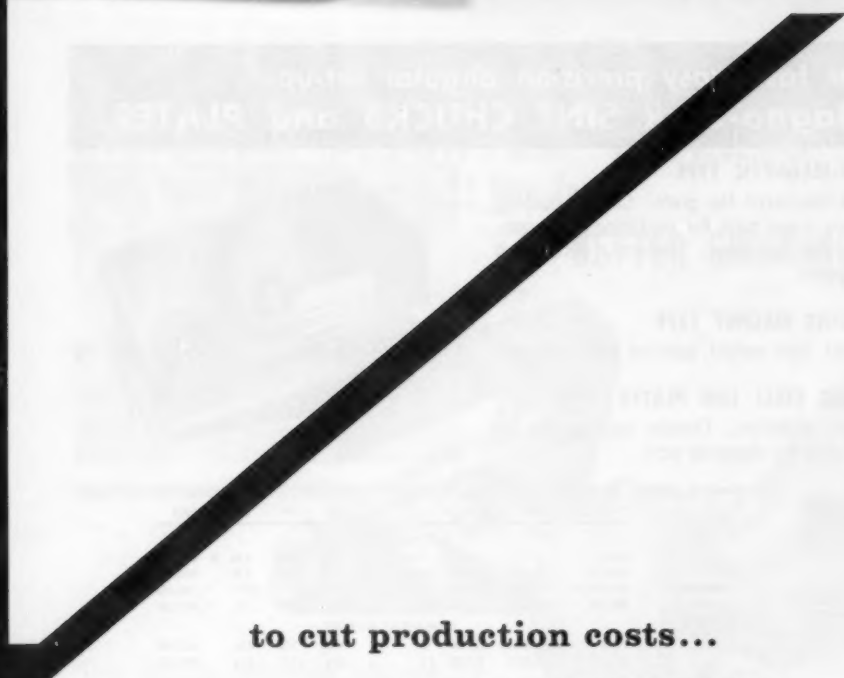
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To identify a strange fish...



you call in an **ICHTHYOLOGIST**

*(specialist in fish life)*



**to cut production costs...**

**you call in LINCOLN**

*(specialists in arc welding)*

**B**ECAUSE of high operating costs a Maryland barge builder had trouble meeting competitive prices. The LINCOLN Field Engineer recommended a semi-automatic "Squirt" welder. On heavy plate it was four times faster and reduced overall costs due to reduced plate preparation and cleaning time.

As a matter of fact, right there is a good reason for doing business with LINCOLN. Cost reduction is a sort of religion at LINCOLN where production costs have dropped as much as 50% in the last 20 years. It's the result of LINCOLN'S world-famous cooperation between employees and management where everybody gets paid according to his own contribution to the company's goal—superior products and service to you at continually decreasing costs.

That's why we say it's a good idea to do business with LINCOLN where arc welding is a specialty and cost reduction comes to you as a "plus" at no charge.

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Dept 2119 • Cleveland 17, Ohio



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# For fast, easy precision angular set-ups Magna-Lock SINE CHUCKS and PLATES

## ELECTRO-MAGNETIC TYPE

Exclusive laminated top plate. Circular locking take-up on hinge rolls for continuous accuracy. All-steel, moisture-proof. Uniformly distributed holding power.

## PERMANENT MAGNET TYPE

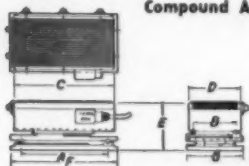
Low height, light weight, positive holding power.

## HARDENED STEEL SINE PLATES

Completely stabilized. Circular locking take-up. Tapped holes for clamping work.

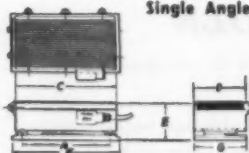


### Compound Angle Sine Chuck



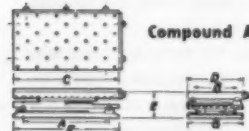
MODEL	(SINE) A	(SINE) B	C	D	E	F	G	PRICE
ELECTRO-MAGNETIC								
DA-5	5.000	5.000	6 1/2	6	5 1/4	7 1/4	6 1/2	\$ 443.00
DA-10	10.000	5.000	11 1/2	6	5 1/4	12 1/4	6 1/2	590.00
DA-1010	10.000	10.000	11 1/2	10	5 1/4	12 1/4	10 1/2	1,180.00
DA-20	20.000	5.000	21 1/2	6	5 1/4	22 1/4	6 1/2	1,400.00
PERMANENT MAGNET								
DP-5	5.000	5.000	6	6	5 1/4	7 1/4	6 1/2	443.00
DP-10	10.000	5.000	12	6	5 1/4	12 1/4	6 1/2	590.00

### Single Angle Sine Chuck



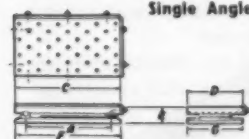
MODEL	(SINE) A	C	D	E	F	G	PRICE
ELECTRO-MAGNETIC							
SA-5	5.000	6 1/2	6	4 1/2	7 1/4	6 1/2	\$310.00
SA-10	10.000	11 1/2	6	4 1/2	12 1/4	6 1/2	390.00
SA-1010	10.000	11 1/2	10	4 1/2	12 1/4	10 1/2	775.00
SA-20	20.000	21 1/2	6	4 1/2	22 1/4	6 1/2	950.00
PERMANENT MAGNET							
SP-5	5.000	6	6	3 1/2	7 1/4	6 1/2	310.00
SP-10	10.000	12	6	3 1/2	12 1/4	6 1/2	390.00

### Compound Angle Sine Plate



MODEL	(SINE) A	(SINE) B	C	D	E	F	G	PRICE
DA-5P	5.000	5.000	6 1/2	6 1/2	3 3/4	7 1/4	6 1/2	\$ 430.00
DA-10P	10.000	5.000	11 1/2	6 1/2	3 3/4	12 1/4	6 1/2	565.00
DA-1010P	10.000	10.000	11 1/2	11	3 3/4	12 1/4	11	1,050.00
DA-20P	20.000	5.000	21 1/2	6 1/2	3 3/4	22 1/4	10 1/2	1,350.00

### Single Angle Sine Plate



MODEL	(SINE) A	C	D	E	F	G	PRICE
SA-5P	5.000	6 1/2	6 1/2	2 1/2	7 1/4	6 1/2	\$280.00
SA-10P	10.000	11 1/2	6 1/2	2 1/2	7 1/4	6 1/2	380.00
SA-1010P	10.000	11 1/2	11	2 1/2	12 1/4	11	750.00
SA-20P	20.000	21 1/2	6 1/2	2 1/2	22 1/4	6 1/2	920.00

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## BETTER GRINDING



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Mechanical accuracy you can depend on for truth concentricity and precise wheel shape.

Accurate stainless steel mandrels specially fluted and bonded to the wheel . . . guaranteed not to come loose or pull off.

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METAL CUTTING SAWS

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the extra value  
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WALKER-TURNER

## 20" drill presses

You want the most efficient set-up for every job—*now* and when your production requirements change. That's where Walker-Turner "Light-Heavyweight" 20" drill presses can really pay off. These fast, rugged, accurate tools cost far less than many single-purpose machines—yet can do the same work when used as components in standard or semi-automated set-ups. They can be adapted, quickly and economically, to handle *hundreds* of applications. Built to withstand years of heavy duty wear, W-T drill presses offer lower maintenance costs, save you money in reduced operating expenses.

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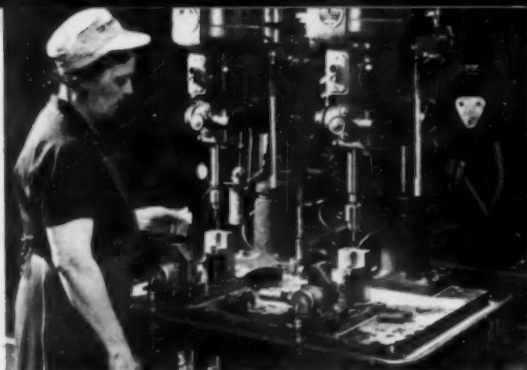


For **FREE CATALOG** of the complete line of W-T metalworking tools, write: Rockwell Manufacturing Co., Walker-Turner Division, Dept. WF-23, 400 N. Lexington Ave., Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Co. of Canada, Ltd., Guelph, Ont.

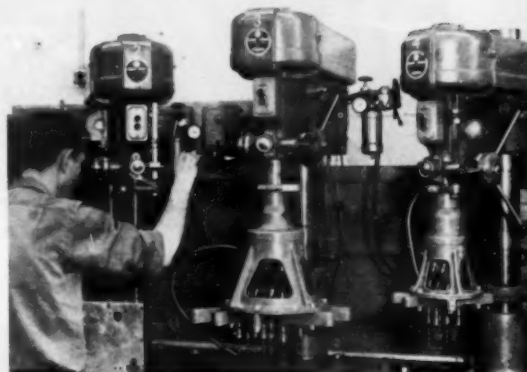
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LIGHT-HEAVYWEIGHT MACHINE TOOLS

another fine product by

**ROCKWELL**



2 Spindles—drilling and tapping



3 Spindles—multiple hole drilling (2 speeds)



24 Spindles—sequence operations

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## 50 SERIES PRESSES

- Readily adaptable to wide variety of work.
- Large box-type slide, mounted in long gibs, maintains accurate alignment.
- Rigid frame design resists deflection under heavy work loads.
- Dies mate perfectly — wear is minimized. Close product tolerances stay close.
- Proven L&J features insure long dependable service, cut maintenance.

### SPECIFICATIONS

Two capacities—50 or 60 tons, geared and non-geared models. Slide face 24" x 12". Bolster 36" x 24". Opening through back 22". Shut height 11'". Slide stroke 4'". Slide adjustment 3". \*or to suit

*Write for catalog.*

**L&J PRESS CORPORATION**  
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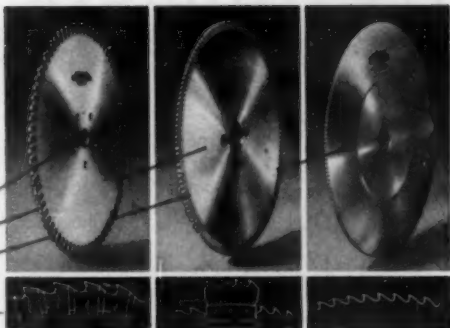
• Do you cut ferrous metals? If so, Simonds has three basic saw designs for you:

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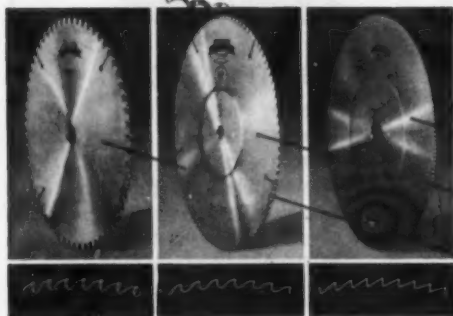
**SEGMENTAL SAWS**

**SOLID TYPE SAWS**

Available in High Speed and Semi-High Speed Steels



There's a  
**SIMONDS Circular Saw**  
Exactly Right for Your  
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If you're cutting  
non-ferrous metals,  
Simonds offers you:

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Available in "Si-Maloy", in High-Speed Steel for cutting where extreme abrasiveness is present, and in Semi-High Speed Steel.

**HIGH SPEED STEEL, HARD RIM SAWS**

Hard cutting edge, soft center gives you long life coupled with safety.

**CARBIDE TIPPED SAWS**

for cutting aluminum and magnesium, as well as other non-ferrous metals

No matter what kind of metal you're working, there's a quality Simonds blade just right — a blade that means faster, cleaner cuts, longer blade life and maximum performance.

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# NOW...index tables

FOR MORE  
ECONOMICAL  
PRODUCTION  
ON THESE NEW

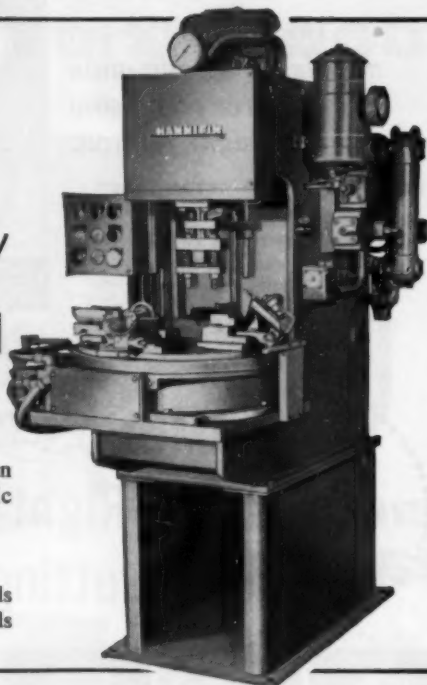
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"FD" PRESSES

Heavy-duty open-gap production presses with Hannifin hydraulic index tables...

*Available in all of these sizes:*

2, 3, 4, 5 and 6-ton bench models  
6, 8, 10, 12 and 15-ton floor models



### WITH THESE FEATURES...

- Dual Safety Hand Lever Controls
- Dual Electric Push-Button Controls
- Adjustable Stroke Control
- Reverse on Pressure or Distance
- Full Automatic Cycling
- Hannifin High Speed Hydraulic Index Tables
- Reciprocating Hydraulic Slide Feeds

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Call in your nearby Hannifin man—he's a trained production analyst—to prove how you can do more at lower cost with Hannifin presses. Or, write for our new Bulletin 132. It tells the whole story.

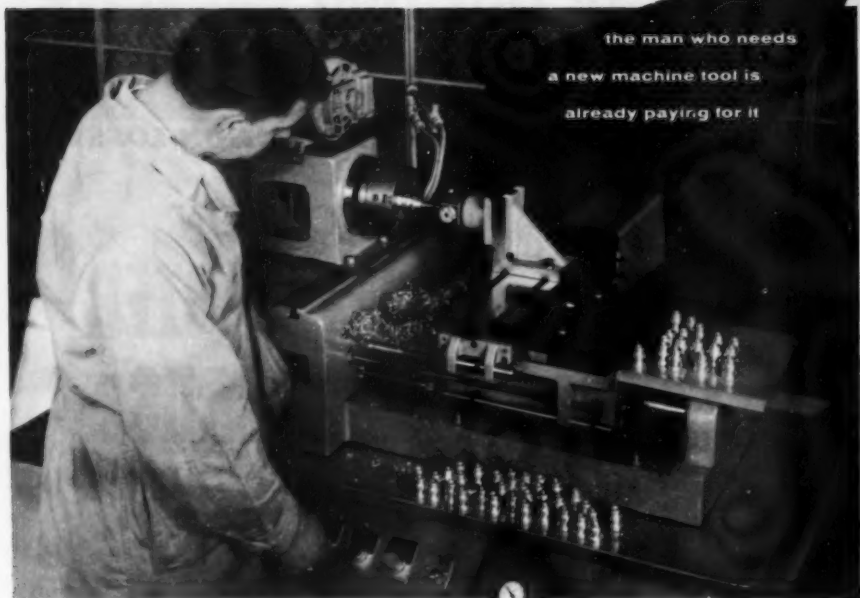
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529 South Wolf Road • Des Plaines, Illinois

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the man who needs  
a new machine tool is  
already paying for it

## "Stingiest" Machine ever made

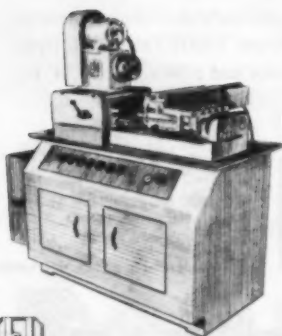
**The J & L Precision Boring Machine** is a mechanical tightwad: "Savings" for the owner are written all over it.

To begin with, its purchase price is far less than you would guess. Then, after it is set up, you find that just about anyone can handle its push button operation. Its simple design doesn't require expensive maintenance either.

This machine's "tightness" extends even to the spindle. It's not only extremely accurate, but also allows adaptation of various types of tooling. It has a threaded nose that will accept all standard air, or manually operated chucks and an inside taper to accommodate 5C collets.

Think that's economical? Well this penny pincher will turn, face and bore at high production rates, yet, because tooling combinations can be shifted quickly, it takes care of the short runs too.

One other thing about the J & L Precision Boring Machine . . . it has a tendency to push its owners into a higher income bracket. If this prospect leaves you undaunted, write for further information.



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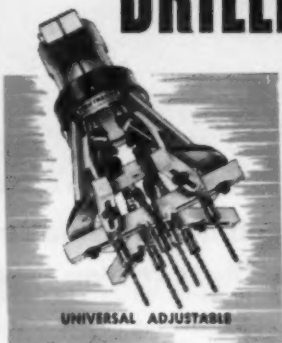
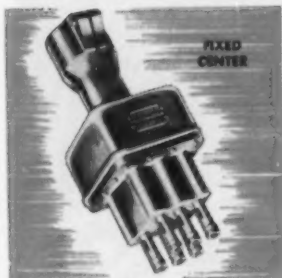
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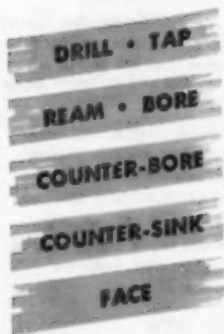
# RUGGED to full tool capacity!

**...FOR LONG WORKING LIFE  
TO ELIMINATE DOWNTIME & PRODUCTION LOSSES!**



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Tremendous economies from the use of multiple-spindle drillheads are obvious. Use **THOMSON THRIFTMASTER** Drillheads for optimum performance and profits. *Ask NOW for our new catalog.*



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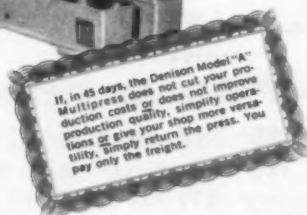


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a small hydraulic press  
so productive  
your savings are..

# GUARANTEED



**MODEL "A" Denison hydraulic Multipress.**  
Available in 1-ton and 2-ton ram capacities.  
1-ton model . . . \$295  
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**GUARANTEED** savings in your plant — on any job — assembly, forming, staking... or 101 other press operations. Denison's confidence in the field-proven performance of the Model "A" hydraulic Multipress makes this unique offer possible. Check these important advantages — high speed cycle... easy pressure adjustment... foolproof safety controls... manual or automatic operation... ample 8" daylight for tooling... compact size—only 24" high... smooth, controlled hydraulic pressure does all your pressing jobs better and faster... 1-ton and 2-ton capacity.

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HYDRAULIC PRESSES  
PUMPS • MOTORS • CONTROLS

## DENISON

### HYDRAULIC MULTIPRESS

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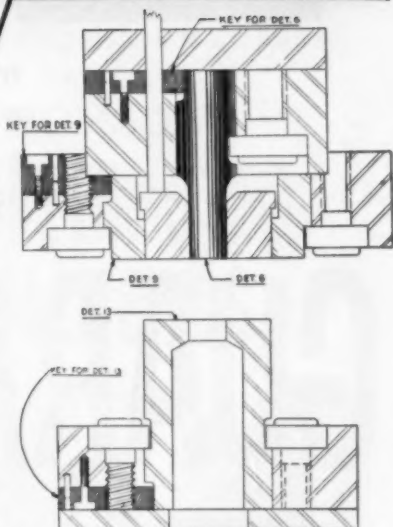
# NEW HOVIS KEY-ALIGNED DIE

THE LATEST ADDITION TO OUR STANDARD UNITS

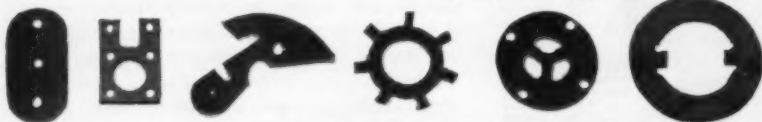
**a must  
for irregular  
stampings**

**ELIMINATES ALL SET-UP  
ERRORS AND INSURES  
UNINTERRUPTED ACCURACY**

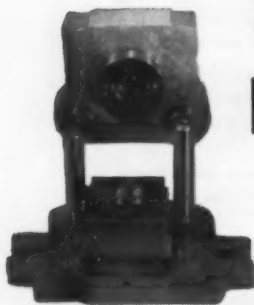
When producing irregular shaped stampings, it is important that the cutting members of the die are located in the proper radial alignment. Hovis has introduced the key-aligned die to meet this requirement . . . With the key-aligned die any press operator can install the inserts without the possibility of misalignment. This is accomplished with a flat on the insert which locates against a key in the retainer.



A section line drawing showing the principle of the Hovis key-align method.



An example of some irregular pieces these dies produce by merely purchasing special sets of parts on which we are glad to quote



Made in 6 sizes:  
3/4"-1 1/2"-2 1/2"-4"-6"-8"

## HOVIS UNIVERSAL COMPOUND DIES

for producing **WASHERS** and **SMALL STAMPINGS** . . . No need to make a **NEW DIE** for every **STAMPED PART**

By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.

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Suburb of Detroit

Precision Ground



SOLID CARBIDE  
TOOLS AND BURS

# Job Applications



eter and 1" to 1½" in length.

New cutting efficiency has been designed and engineered into a new line of Atrax Stub Routers. These are solid carbide standard, off-the-shelf tools available in nine sizes from 1/16" to 1/2" diameter and 1" to 1½" in length.

Precision ground, the Series 1546 Router has a single, straight flute, straight shank and right hand cut. Tolerances are kept to +.000 - .003.

## SHOP TESTS PROVE SUPERIORITY

Photo A shows the second of two high speed steel routers failing to cut copper clad Fiberglas printed circuit board. Note the burning of tool and material and the jagged hole at left in test work piece.

The new Atrax Router plunged and cut at 20,000 rpm leaving clean slot shown in photo B.

## COMPARISON OF TEST TOOLS



Two high speed routers on left were unserviceable after a few seconds. Atrax Solid Carbide Router showed no wear land and left clean slot with no bur on either side of printed circuit board.

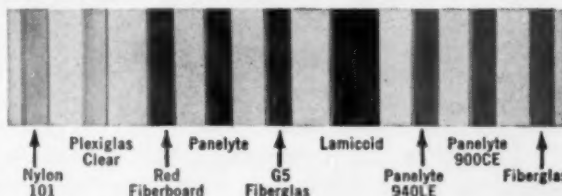
## NEW ATRAX STUB ROUTER PLUNGES, SLOTS, FORMS EXTREMELY HARD-TO-CUT MATERIALS



## ADDITIONAL TESTS ON OTHER TOUGH MATERIALS

Nine other materials commonly used in printed circuit board work were tested. All were cut quickly and efficiently with the new Atrax Router.

These materials can also be drilled readily with the new Atrax Micro-Drills available in wire sizes from #1 to #80.



## SOLID CARBIDE TOOLING RESULTS

Many new, extremely tough materials can be worked faster, easier with Atrax Routers, Drills and End Mills. The Atrax Company can furnish information on speeds and feeds for best results.

Send for 148  
Page "Standard  
Reference" on  
Solid Carbide  
Tools...

THE  
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240 DAY STREET,  
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SYNTRON cost-reducing equipment of proven dependability

# handle parts automatically



***SYNTRON***

Vertical Vibratory

## PARTS FEEDERS

... feed parts of almost any size, shape and material in oriented position to automatic marking machines, assembly units, hobbers, inspection machines and many other automatic operations.

Simplicity of design provides automatic operation with dependability, high rate of parts flow, instant finger-tip control and low maintenance.

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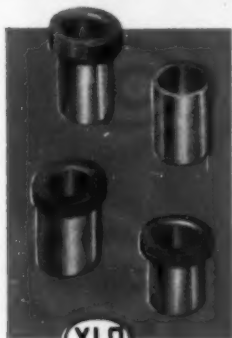
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**Up to twice as much production  
per .001" of wear!**

**TEST REPORT SHOWS THERE IS A DIFFERENCE IN BUSHINGS**



**XLO**

Ex-Cell-O  
For Precision

Ex-Cell-O Bushings out-perform competition.

An automotive manufacturer put Ex-Cell-O Bushings up against two other leading brands in a practical on-the-job test. Result: Ex-Cell-O out-produced brand A by 1210 pieces, brand B by 345 pieces! Average number of parts pro-

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Brand A...1,045 pieces

Brand B...1,910 pieces

Ex-Cell-O...2,255 pieces

Try Ex-Cell-O Bushings and see for yourself.

Catalog available on request.

**EX-CELL-O**  
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MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS •  
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**SANFORD MG GRINDER  
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in a SINGLE COMPACT  
UNIT**

**MG GRINDER ALSO AVAILABLE FOR  
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WITHOUT DUST COLLECTOR**

The most widely used precision machine for unit grinding. Famous for its unsurpassed workmanship, quality and vibration-less operation. The MG is the grinder that's been "copied" but never equaled.

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**FLOOR SPACE** — 45" x 38". 62" high on floor stand. **NET WEIGHT** — 600 lbs.

**DUST COLLECTOR:** BUILT INTO GRINDER FLOOR STAND. EXHAUST CAPACITY—650 CFM. MOTOR — 1/2 HP, 3450 RPM, single or 3 phase. **NET WEIGHT** — 140 lbs.

**A  
COMPLETE  
DUST COLLECTOR  
INCORPORATED INTO  
GRINDER STAND.**

- Exclusive design exhaust hood catches all sparks.
- Can be wired to grinder starter.
- Uses standard size filters—renewable or disposable type, or a combination of both.
- No outside exhaust needed.
- Saves floor space.
- Full size rear door gives access for cleanup.

**SANFORD** MANUFACTURING CORP.  
1026 Commerce Ave., Union, N. J.

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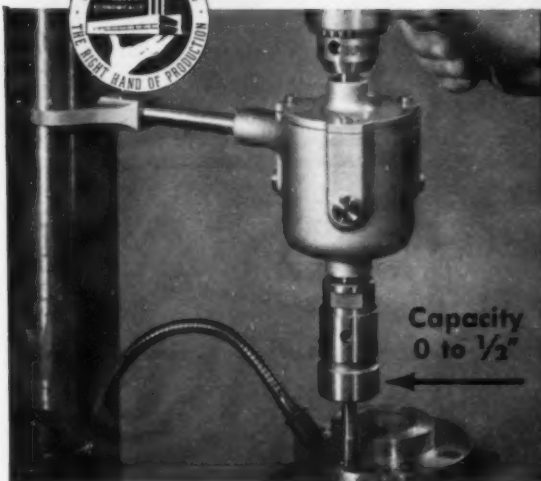
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FOR THE FIRST TIME ...

## 0-1/2" CAPACITY TAPPING HEAD

FOR JUST \$63



### Check VersaTAPPER Features:—

- Capacity 0-1/2"
- Comes complete with tap chuck
- Ball bearing spindle
- Runs in oil
- Fits any drill press
- Fully guaranteed
- Installs in seconds

## Supreme VersaTAPPER

### DRILL PRESS TAPPING ATTACHMENT

The new Supreme VersaTAPPER gives tremendous tapping versatility—at a price that is no higher than some hand tapping devices. VersaTAPPER's capacity range is from 0 to 1/2". VersaTAPPER fits any drill press. It can be installed or removed in seconds. Why not circle

number on reply card and get full information on the VersaTAPPER. Available in two models:—No. 6100, with straight shank for chucking; No. 6200 with No. 2 Morse Taper Arbor for direct installation to drill press spindle. Each model—\$63.00.

From the makers of SUPREME BRAND CHUCKS

**SUPREME PRODUCTS CORPORATION**  
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DIV. OF A-S-R PRODUCTS CORPORATION

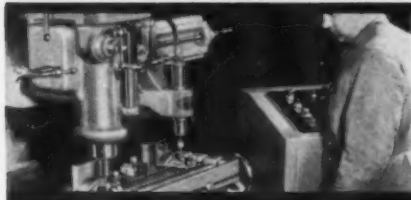
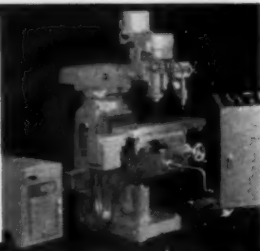
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**THIS INTRICATE  
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WAS MILLED  
AUTOMATICALLY**

ON A GORTON

*Fully Automatic*  
**AUTO-TRACE DUPLICATOR**



**NO  
MANUAL GUIDANCE  
BY OPERATOR  
REQUIRED**

**Numerical Control Benefits at The  
Low Cost of GORTON Automatic Tracing**

This new concept in automation duplicates numerical control results in many instances ... at much lower cost. Complex shapes can be quickly machined, at tolerances and feed rates never before possible. Human error and resultant scrap, are eliminated, and the machine quickly pays back its moderate cost.

The new GORTON 180° Auto-Trace combines instantaneous electronic tracing response with smooth, positive hydraulic feeds. Exclusive features include all-new,

completely integrated, built-in automatic tracing system; dual-purpose deflection meter; increment cross-feed; automatic, co-ordinated feed; area and plateau controls ... plus special attachments that increase versatility and efficiency. If you have a machining problem which calls for numerical control benefits and for completely operator-free automatic production, it will pay you to investigate this new Gorton Auto-Trace electro-hydraulic 180° Duplicator. Write for Bulletin 2968.



MACHINE TOOL EXPOSITION 1966

If interested in completely automatic 360° production profiling on the same type of machine described here, write for Bulletin 2972.



**GEORGE GORTON MACHINE CO.**

1400 RACINE STREET

RACINE, WISCONSIN

Milling, Die Sinking, Profiling and Engraving Machines with Manual Hydraulic, Electro-Hydraulic or Numerical Guidance Systems.  
SINCE 1893 Special Machines and Automated Transfer or Indexing Machines. Cutting Tools and accessories... Defense and special products.

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MASTER FEEDERS AND PADS;  
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COLLETS FOR ALL MAKES

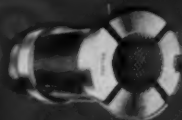
### SPECIAL

COLLETS; TOOLS; CHUCK JAWS;  
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**Sutton Tool Co.**

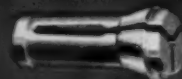
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Standard collet for  
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MATIC BAR  
MACHINES.



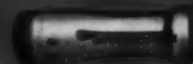
Style "A" master  
feeder with taper,  
magnetic, and  
flexible pads.



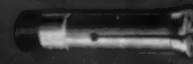
Standard collet for  
SHAWY AUTO-  
MATIC.



Standard collet for  
4 and 6 spindle  
GREENLEE AUTO-  
MATIC BAR  
MACHINES.



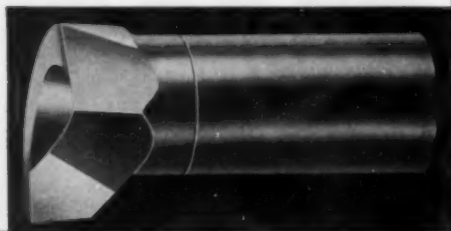
Super (rough-type)  
adjustable tension  
feeder. For all  
Automatics.



Standard collet for  
DAVENPORT  
AUTOMATIC BAR  
MACHINES.

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# Check CRITERION for boring tools



## BORING TOOLS

Complete range of sizes.  
Boring tools in both High Speed and Carbide to enter holes from 1/16" dia. to 2".  
Criterion design permits 20% greater tool life.  
Styles include tools for general boring or bottoming and facing.  
Also available in extra long shank lengths.

## THREADING TOOLS

Internal Threading Tools in both High Speed and Carbide to enter holes from 1/16" to 2" diameter.  
True thread form remains for life of tool.  
Top face grinding, only, is required to resharpen.  
Available in both standard and extra long shank lengths.

## GROOVING TOOLS

Retaining Ring and "O" Ring Grooving Tools in High Speed only, available in all standard sizes.  
These are ground to exact specifications as adopted by the National Aircraft Standards Committee, U.S. Army and Navy Ordnance and leading industrial concerns.

See these tools at your local dealer or write for literature.

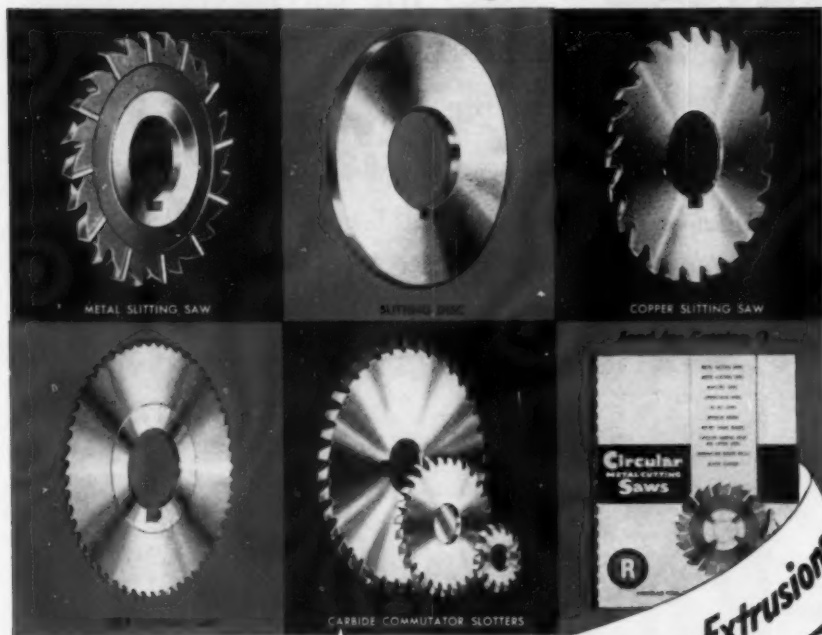


**CRITERION**  
MACHINE WORKS  
756 WEST SIXTEENTH STREET  
COSTA MESA, CALIFORNIA

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**From More Than 1200 ® Catalog Items...**



**Saws for Aluminum Extrusions**



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**CIRCLE R** saws for cutting aluminum extrusions are designed for high efficiency, scientifically perfected with exclusive Circle R Heat Treating. Aluminum extrusion saws are listed among more than 1200 items in our catalog — and we also design for your special needs.

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ROCHESTER

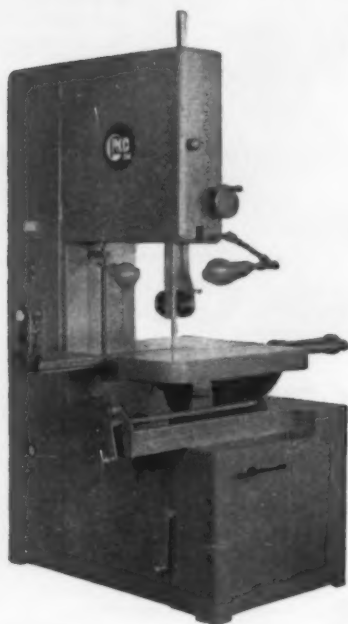
**CIRCULAR TOOL CO., INC.**  
PROVIDENCE 5, RHODE ISLAND  
**Specialists in Circular Cutting Tools Since 1923**

METAL SLITTING SAWS • COPPER SLITTING SAWS • SCREW SLITTING SAWS • COMMUTATOR SLITTING SAWS • JEWELERS' SLITTING SAWS • CUT OFF SAWS • CIRCULAR KNIVES & ROTARY SHEAR BLADES • CIRCULOT STEEL SAWS • SOLID & TIPPED TUNGSTEN CARBIDE SAWS • COMBINED DRILLS & COUNTERSINKS • CENTER REAMERS

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- Variable drive 3-speed transmission with precision rolled gears and splines transmits 15 HP

- Hydraulic table feed

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or

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# MILFORD® ATOM-LUBE MIST COOLING SYSTEM

## INCREASES TOOL LIFE 20-30%!

In this unique system, a powerful air jet carries a mist of finely atomized fluid direct to the cutting point of the tool and—at the same time—dissipates heat far faster than ordinary flood-cooling methods. Since heat, not wear, is the biggest factor in tool failure, Atom-Lube increases tool life 20 to 30%, improves work quality, and helps accuracy. A non-circulating system, Atom-Lube costs less to buy, install and operate than recirculating systems . . . and is quickly and easily added to machine tools of practically any type. Available in single and double nozzle types; uses any liquid from plain water to heavy oils. Write now for complete information . . . or ask for a demonstration and see for yourself how the Atom-Lube System can help reduce your machining or grinding costs.

### BUY FROM YOUR MILFORD DISTRIBUTOR . . .

a local businessman, who stocks the tools and equipment you need. You'll **SAVE TIME, CUT BUYING COSTS** and **REDUCE INVENTORIES.**



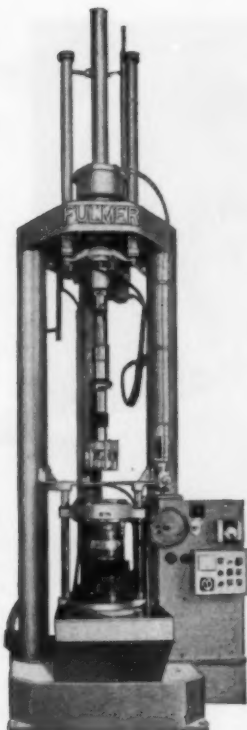
### THE HENRY G. THOMPSON & SON CO.

Saw Specialists for Over 80 Years

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# Why does the best ...cost less?



Honing machines, unlike most machine tools, do not require massive weight and rigidity to maintain accuracy. Fulmer designers recognize this basic concept by "beefing up" their machines only where it counts . . . with heavy-duty oversize spindles, bearings and gear train . . . the vital working parts. Functionally designed Fulmer Honing Machines save you money by eliminating needless masses of high-priced cast iron and steel . . . they *weigh less, cost less.*

Fulmer machines combine simplicity with flexibility, quality with economy. All this and never a charge for service!

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WORLD'S BEST

## Honing Machines

# BUNTING<sup>®</sup> BEARINGS

## Bunting local machine shop service solves many critical problems

One, or small lots of specially designed bearings, not obtainable from stock, can now be procured immediately through your Bunting Distributor. Fully equipped machine shops in Bunting Branches are at your service for emergency and experimental needs. The wide range of sizes of Bunting stock cast bronze and sintered bronze bearings makes easy the alteration of a stock to a special bearing at low cost. Bunting Cast or Sintered Bronze and Bunting Bearing Aluminum Bars provide the material for special sizes and designs which cannot be made from stock bearings. Your local Bunting Distributor can arrange for such work.

*Case in Point* Showing some common alterations of Bunting Standard Stock Cast Bronze Bearing, No. G-1191. Size  $1\frac{1}{4}$ " ID x  $1\frac{1}{4}$ " OD x 2" long.



1. Cut to 2 pieces  
 $15/16$ " long.



2.  $\frac{1}{4}$ " hole in center of bearing.



3. Flange bearing  
 $1\frac{1}{4}$ " ID x  $1\frac{1}{2}$ " OD x 2" long



4. Style #5G  
Graphited.



5. Style #4  
Oil Groove.

### Ask for Catalogs:

- No. 158** Complete listing of sizes of Bunting Cast Bronze and Sintered Bronze Bearings and Bars, and Bunting Bearing Aluminum Bars, Pocket size edition.
- No. 258** Complete listing of Cast Bronze Electric Motor Bearings for all makes and sizes of electric motors.
- No. 46** Technology of Bunting Bearing Aluminum. A technical treatise on the composition, machining and use of this new bearing metal. Ask your local Bunting Distributor.

**THE BUNTING Brass and Bronze Company**

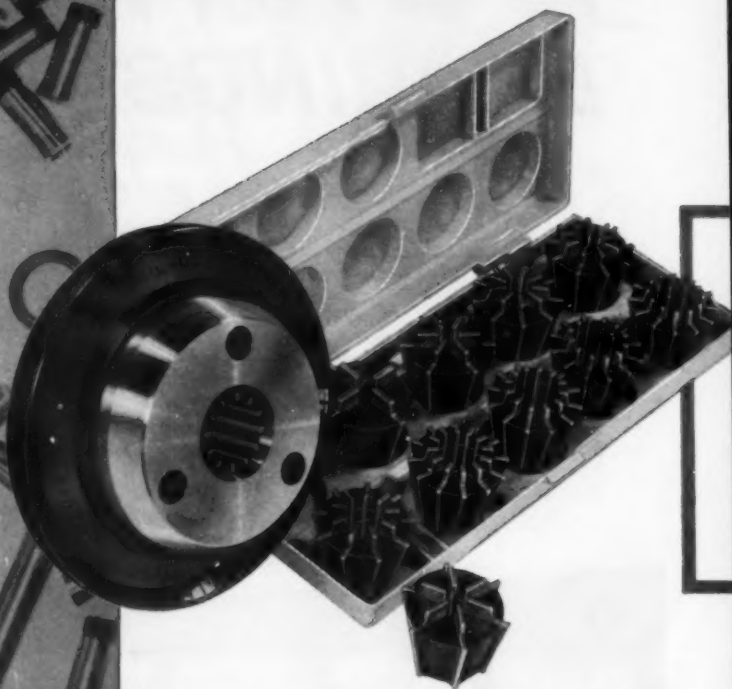
TOLEDO 1, OHIO • BRANCHES IN PRINCIPAL CITIES

BEARINGS, BUSHINGS, BARS AND SPECIAL PARTS OF CAST BRONZE, SINTERED METALS OR ALUMINUM ALLOYS

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**Throw those  
old fashioned collets away!**



Now you can afford to equip your  
*Atlas* **SHILTON DELTA SOUTH BEND** *Logan*  
lathes with the world's most modern  
collet chuck and its Rubber-Flex Collets

**\$70<sup>00</sup>**

Model 50  
Collet Chuck

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Complete Set of  
10 Rubber-Flex Collets



# You get a lot more for less!

model

# 50

- is a brand new nose type handwheel chuck
- is quicker to operate
- is easier to operate
- is more accurate
- develops more torque
- increases lathe capacity
- mounts directly onto your spindle
- costs less . . . less . . . less . . .

## A lot more for a lot less...

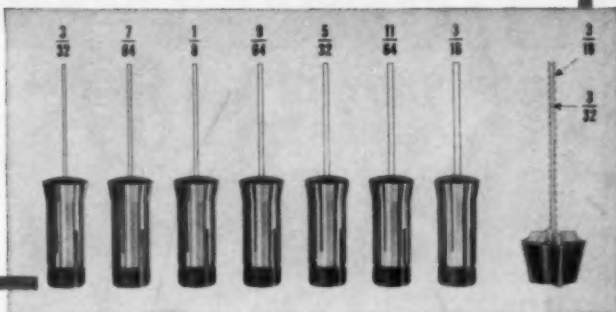
# \$70<sup>00</sup>

for the chuck!

# \$65<sup>00</sup>

for the collets!

(\$6.50 each)



An entirely new series of ten Jacobs Rubber-Flex Collets has been developed along with the world's most modern collet chuck. Rubber-Flex collets do more because:

- Jaws are always parallel for greater accuracy . . . maximum runout .001".
- Long bearing surfaces have stronger grip.
- Only 10 collets chuck all bar sizes— $\frac{1}{16}$ " to  $1\frac{1}{16}$ "—.100" range per collet.

### How one Rubber-Flex collet replaces seven split steel collets

This is the chuck,  
these are the collets,  
for your . . .

ATLAS • DELTA • LOGAN  
SHELDON • SOUTH BEND  
. . . lathes

See your Jacobs industrial supply distributor. Let him prove these fantastic facts with a convincing demonstration at your desk! Call him today.



# Jacobs

## CHUCKS

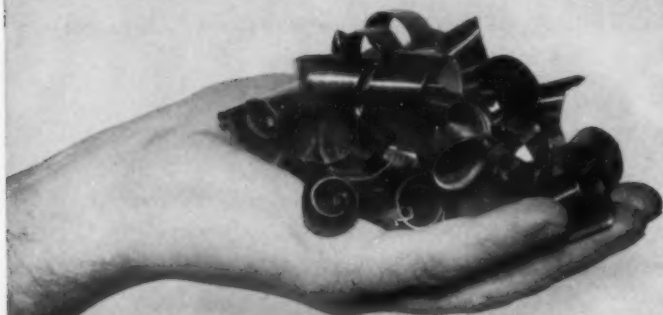
JACOBS MANUFACTURING COMPANY • WEST HARTFORD, CONNECTICUT

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June, 1960

81

**Why did these chips**



**cost more than these?**



**LOOK TO  
INGERSOLL  
FOR THE  
ANSWER**



—because the cutter used to produce the more costly chips was not the right one for the work or for the machine on which it was used. It was a good cutter but not as good as it could have been. It's as simple as that.

The lower cost chips were produced by a cutter recommended by Ingersoll Cutter engineers. Their recommendation was based on an analysis of the

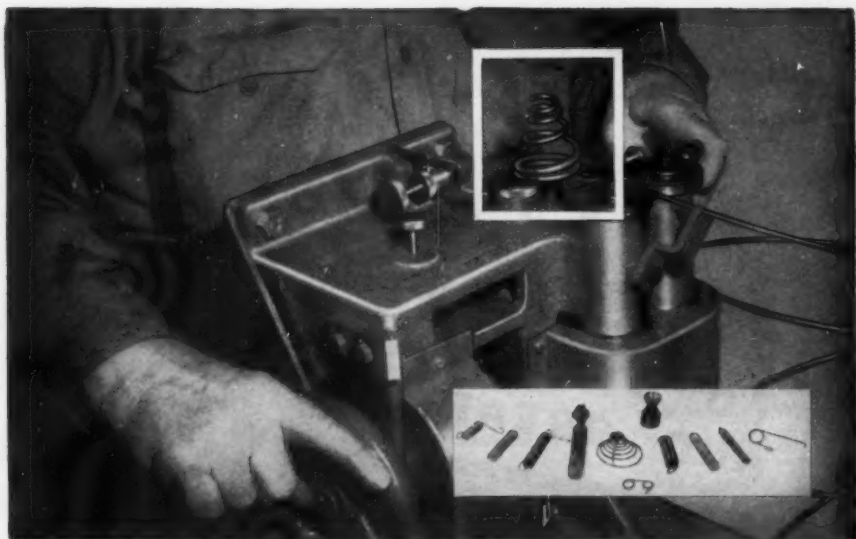
work, the job requirements and the machine.

There are many ways that the cost of chips can be reduced. Why not let an Ingersoll representative make a preliminary survey? It will cost you nothing and may lead to important savings. Ask to have a representative call, or write for booklet "Ways to reduce the cost of chips." Address Dept. **E-68**.

**THE INGERSOLL**  
**MILLING MACHINE COMPANY CUTTER DIVISION** ROCKFORD, ILLINOIS

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MACHINE and TOOL BLUE BOOK



## Any spring made fast in your shop! WITHOUT USE OF ARBORS

For a replacement or experimental spring, any shape, diameter or pitch from flat or round wire sizes .005" to .125", you can produce it in a matter of seconds with Perkins Precision Spring Coiler. You eliminate arbors, yet turn out precision springs — torsion, compression, extension, tapered, or special springs, coiled either left or right hand, in any desired length, any diameter from 3/32" to 12" and larger, with or without initial tension, and with

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**PERKINS**

MACHINE AND GEAR CO.

Special Machinery Division,  
West Springfield, Mass.



Starrett adjustable jaw cut nippers (left) and Gardener Hook-Kon spring looping tool (center) — handy, precision, time-saving accessories for spring coiling. Perkins Spring Coiler available as bench model or power model shown here, (right) for tool shop or continuous runs.

Perkins Machine and Gear Co.  
Special Machinery Division, Dept. A-2  
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Please send information and prices on  
Perkins Spring Coiler.

Hand Model ☐ Power Model ☐

Name.....Title.....

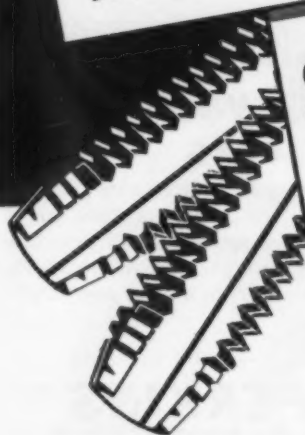
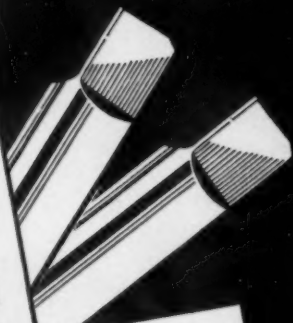
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Triple Tempering makes SOSSNER taps the toughest taps going. This extra toughness gives you longer life plus trouble-free performance. You get greater resistance to chipping and breaking. Prove it to yourself! Try SOSSNER taps with extra toughness at no extra cost.

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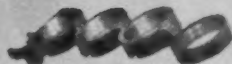
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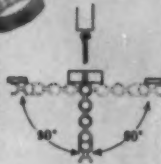
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# 1 Man out-produces 3 Increases Production 920% with a BURGMASER Bench Model Turret Drill...



Three end radial holes in this Computer Bridge are drilled and tapped in one setup. The 14 tap holes are subsequently drilled on another Burgmaster.



95% of Burgmaster Users Report up to 230% Savings. Write for the complete facts. Free literature illustrates and describes machine features including specifications and accessories.



## BURGMASER CORPORATION

SMALL TOOL DIVISION—BURG TOOL MANUFACTURING CO., INC.

13001 S. Figueroa St., Box 311, Gardena, Calif. • Phone: FAculty 1-3510—Phone, wire or write Dept. OA

World's largest manufacturer of turret-type drilling and tapping machines.

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### Six Spindles in 1/3 Floor Space

Hoffman Electronics, Los Angeles, California, converted production of Computer Bridges from a line of 3 Single Spindle Drills requiring 3 men, to a Burgmaster 6-Spindle Bench Model Turret Drill. Formerly, the 3 men produced 40 parts per hour requiring 3 drill jigs. Now, one man produces 136 parts per hour on the Burgmaster Machine, an increase of 920% on a per man basis.

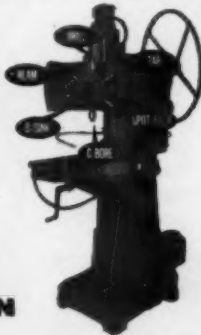
The operations consist of drilling and tapping 3 radial holes, spaced at 90° around the end. The parts are clamped by air in a 3-position fixture, and between operations are swung 90°, left and right against stops. Cam action by the fixture during turning locates proper offset of each hole. The Burgmaster Turret is "Triple Tooled" to save time for drill #104 and tapping #6-32 in sequence.

The turret action of the Burgmaster Machine lends itself to time saving tooling arrangements. Up to 6 separate tools can be rapidly and accurately presented to the work at one station at the most efficient pre-selected speed and required depth of cut.

For fastest investment return, savings in floor space, faster production and reduced operator fatigue, investigate the many advantages of Burgmaster Drilling Machines for reducing production costs:

Bench Model "A"—\$595.00  
FOB Los Angeles — Speed  
ranges from 350 to 6200  
RPM—1/4" Drill and Tap Cap-  
acity in Steel—1/3 H.P.

Burgmaster Model 1C Six-  
Spindle Turret Drill — 12  
speeds from 325 to 4050—  
1/2" drill and tap capacity  
in cast iron—1 H.P.



For best results  
in Surface Grinding . . .  
Always Use Blanchard Wheels!

The flexibility in application of your Blanchard Surface Grinder enables you to attain peak production at lowest cost on hundreds of different grinding jobs. *But, it is very important that you use the right wheel for each job!*

Blanchard makes and stocks a great variety of silicate, resinoid and vitrified bonded wheels and segments. Ask your Blanchard representative to help you select the wheel — or wheels — best suited to your requirements. Call or write him today. And may we send you a copy of "The Art of Blanchard Surface Grinding" (4th Edition)?

THE BLANCHARD MACHINE COMPANY  
64 State Street,  
Cambridge 39, Mass., U. S. A.



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## WHAT'S YOUR BORE-SIZING PROBLEM?

If it's shown here  
—Sunnen Honing  
is your answer!

### TANDEM BORES

Sunnen Honing Tools size and finish both tandem bores simultaneously... assure perfect alignment and identical size of both holes.



### THIN WALL PARTS

... are quickly sized and finished without bore distortion. No fixtures, no chucking — no "spring back!" Accuracy guaranteed to .0001".

### ASK FOR FREE BOOKLET XSP-5075

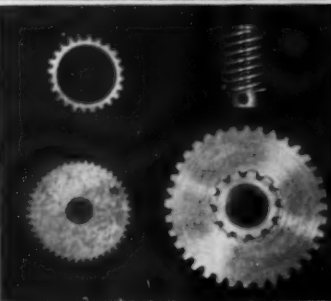
... 99 case histories with production rates. Shows versatility, precision, and fast stock removal rate of Sunnen Honing.



### AVERAGE COST OF SUNNEN HONING MACHINE WITH TOOLING ONLY \$1,000

Standard tooling range:  
.100" through 2.625" dia.  
Built to order: through  
4½" dia.

8071 A



### BORES IN SMALL PARTS

ID's as small as .100" can be quickly sized and precision finished. Sunnen Honing corrects out-of-round, taper, bow, bell-mouth, barrel, and chatter marks.



### PORTED BORES

... long, self-locating honing tool bridges ports... eliminates edge washout... guarantees geometric straightness and roundness of the bore.

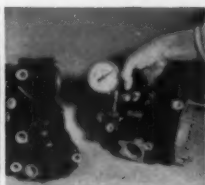
**SUNNEN  
HONING**

SUNNEN PRODUCTS COMPANY

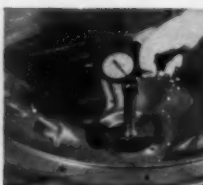
*Here's what they're using to  
gage precision bores on...*



**AIRCRAFT ENGINE**



**FUEL CONTROL  
UNIT**



**TRACTOR  
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COMPONENT**

*and here's why...*

Comtorplug's unique expansion principle gives automatic 2-point gaging shown as a fixed reading to a fraction of the large clear .0001" graduations. With its true 2-point gaging, you can see the diameter at any point of the bore, detecting front or back taper, ovality, barrel shape, bell mouth, etc. If you have a fast-moving volume-precision program, learn why others have adopted this "tells-all" gage by the thousands. It's not expensive. Write for details.

Comtor Company, 62 Farwell Street, Waltham 54, Mass.



**For holes 1/8" to 10" diameter**



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# COMTORPLUG

with interchangeable expansion plugs to gage  
simple or special holes to a fraction of .0001".



A NEW "COMPACT" HITS THE MACHINE  
TOOL FIELD...

# THE NEW HARIG 612

## SURFACE GRINDER

with

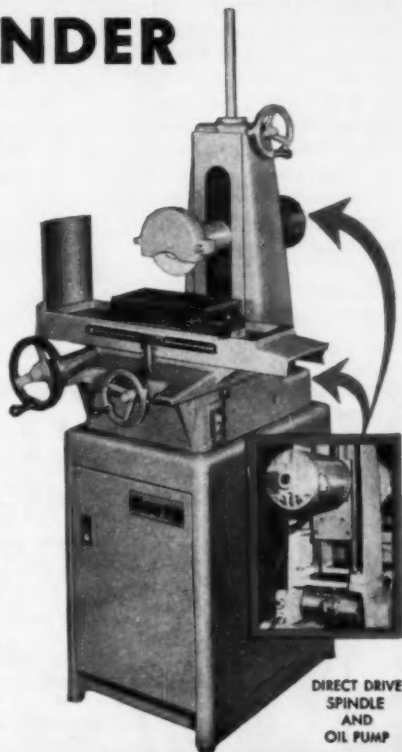
- \* **Automatic forced lubrication**  
goes into operation as soon as machine is started  
— triples life of the ways and preserves original accuracy.
- \* **Direct drive spindle**  
increases power . . . reduces vibration . . . no V-belts to replace.
- \* **Your choice of right or left hand longitudinal feed**

*All Standard Equipment*

The new 612 represents a break-thru in design and construction whereby Harig now offers industry a low-cost, precision surface grinder loaded with features usually found only on expensive models. Easy to operate . . . requires little maintenance . . . built with the precision quality you expect from Harig.

### GET ALL THE FACTS . . .

Write for brochure on the  
Harig 612 Surface Grinder



DIRECT DRIVE  
SPINDLE  
AND  
OIL PUMP



### HARIG'S NEW IMPROVED GRIND-ALL FIXTURE

Easily grinds irregular shaped perforators concentric with shank within  $\pm .0001$  accuracy. Also can be used as milling, boring and inspection fixture. NEW ATTACHMENTS: Radius Dresser Arm and Ball Seat Punch Adapter. (Write for new Grind-All Brochure.)

# Harig

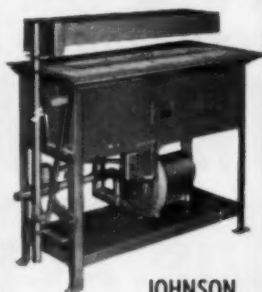
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Provides high, fast heat for metal bending, metal forging, occasional heat treating, metal forming and preheating. Clean, efficient, equipped with four burners. Two end burners have separate shutoff valves, may be turned off for smaller jobs. Operates economically on any type of gas. Convenient gas-air adjustment panel. Adjustable swinging refractory lid. Adjustable front rack to support long pieces and hold tools. Solenoid safety valve turns gas off automatically when blowers are turned off. High temperature, insulated firebox, 5½" by 7½" by 27". Maximum 425,000 BTU input. F.O.B. Factory \$246.00.

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If it burns gas look to Johnson  
Since 1901



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NO. 133 FORGE FURNACE**

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T-Nut & Stud Sets  
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MACHINE and TOOL BLUE BOOK

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**MORE COMBINATIONS • MORE FLEXIBILITY**

**HOLDERS,  
COUNTERBORES,  
COUNTERSINKS,  
PILOTS and  
TOOL CRIB  
CHEST**



**FOR TOOL SHOPS,  
SMALL PRODUCTION  
SHOPS, MAINTENANCE  
AND EXPERIMENTAL  
OPERATIONS  
IN LARGER SHOPS**

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Set No. 13 — 116 Combinations  
Set No. 14 — 149 Combinations  
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Set No. 11 — 130 Combinations  
Set No. 12 — 273 Combinations

**AT AN AVERAGE COST OF ONLY \$1.25  
PER COMBINATION !**

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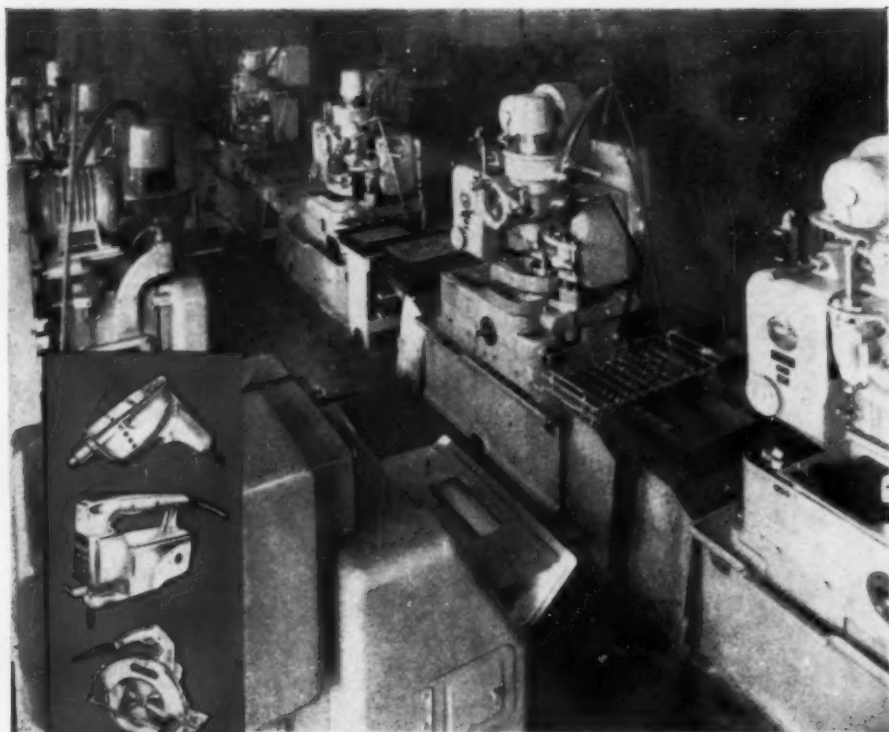


**ECLIPSE COUNTERBORE COMPANY**

**1600 BONNER AVE., DETROIT 20, MICHIGAN**

# FELLOWS GEAR PRODUCTION

## Builds Extra Quality



View of production floor at Stanley Electric Tools, showing some of the Fellows Gear Production Equipment used.

Gears produced with Fellows Machines add high quality to these Stanley Electric Tools.

THE  
PRECISION  
LINE

*Fellows*



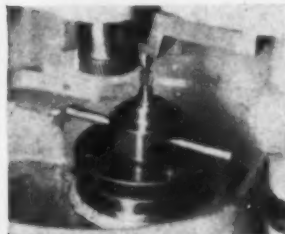
# EQUIPMENT at Lower Cost for STANLEY

Stanley is a name you know . . . a name that stands for high quality in electric tools.

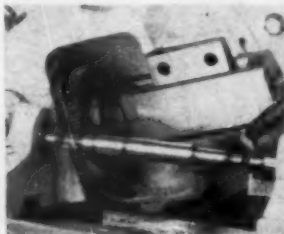
To insure this quality, while providing the high production rates that mean lower costs, Stanley Electric Tools, Division of The Stanley Works at New Britain, Conn., uses Fellows Gear Production Equipment for shaping, shaving and inspecting the armature pinions for its electric tools.

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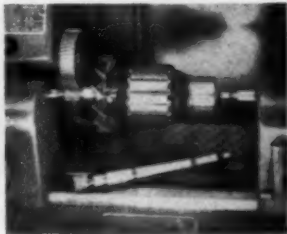
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## BOOK REVIEWS

**PRACTICAL DESIGN OF SHEET METAL STAMPINGS.** *By Federico Strasser. Chilton Co., Book Division, Philadelphia 39, Pa. 175 pages. \$10.00*

The information of stamping technique which the author has gathered in this book will be valuable to anyone engaged in or interested in the production of articles made of die-produced components. Certain fundamental ideas about mechanical design are presupposed, although a specialized education is not a requisite for the reading and study of this text.

This book shows those factors in design of metal stampings which bring about economical and trouble-free production, and also how this may be achieved by intelligent application of basic rules and concepts of stamping technique.

**STARTING AND MANAGING A SMALL CREDIT BUREAU AND COLLECTION SERVICE.** *By Harold A. Wallace. Small Business Administration, Washington, D.C. 187 pages. \$.60*

This is Volume II of the Starting and Managing Series published by the Small Business Administration. The book has as its target two groups: first, those who are thinking of operating credit bureaus and collection services; second, those who are now active in the field. However, students of business management and any small businessman will read this booklet with profit. While it describes in detail the proper ways of starting and operating a credit bureau, it spells out also the pitfalls confronting the newcomer.

Another Book Review appears on page 209.



MACHINE and TOOL BLUE BOOK



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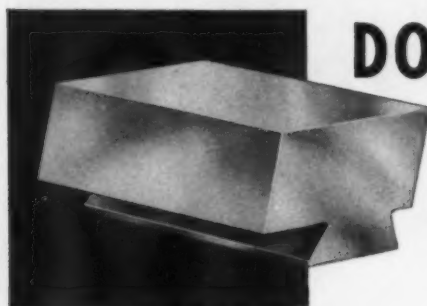
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MACHINE and TOOL BLUE BOOK



# features in this issue



**YOU WILL FIND THE ANSWER IN CHICAGO THIS SUMMER IF YOU WANT TO REDUCE MANUFACTURING COSTS**, says Alan C. Mattison, President of the National Machine Tool Builders' Association in an interview with William F. Schleicher. Mattison comments on new developments in the machine tool industry, the real issues behind the oft-used word "Productivity", and some interesting thoughts about foreign-made machine tools. ....Page 123

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**NOSE CONES—A STUDY IN GRINDING TECHNIQUE**, by Darrell Ward, examines the solutions of problems which confronted Raytheon's Missile Division when they tackled the job of machining aluminum oxide nose cones. Just to confuse matters, the wall thickness of the nose cone is not uniform dimensionally, it being necessary to have a uniform dielectric thickness for the missile's radar. ....Page 131

**WHY DO CUTTING TOOLS FAIL?** asks Dennis Jones in his column on CUTTING TOOLS. The point raised is well taken; for, up to a point, tool wear is directly proportional to temperature. Suddenly things go wrong as the temperature passes a critical point and the wear rate soars. ....Page 111

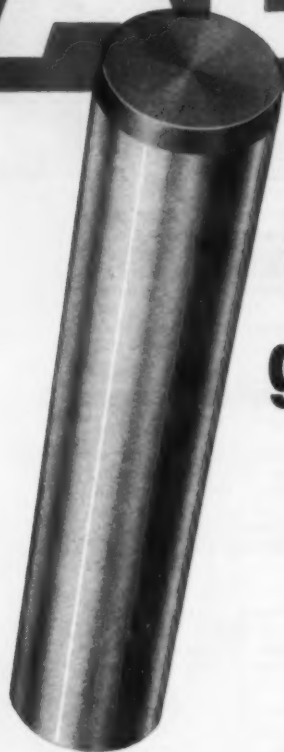
**WHAT DO YOU BEND ON A BENDER?** is concluded in this issue. Engineering Editor Darrell Ward analyzes the selection of mandrels, important points in setting them up, and also reviews troublesome areas in bending which affect the quality of work. ....Page 145

**WHY SLOW DOWN FOR THE CUT-OFF**, when everything else is running faster? A good question, asked by Horace Frommelt, in view of the increasing use of carbide tooling and high machining speeds. While not the ultimate, the next step could be towards the cut-off tool shank with indexable carbide inserts ..Page 138

**BALANCING TOOL LIFE** is more than a dream. By using the laws of friction it is possible to obtain better tool life without reducing the surface feet per minute or by changing the work material specifications. ....Page 105

**AFTER YOU DECIDE TO MAKE A PART, WHICH IS THE BEST WAY TO MAKE IT?** Columnist Allan Young shows how charting cost versus quantity will reveal the need for changing methods. Trouble is, not many engineers follow through by producing complete charts. ....Page 119

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## seen and heard in industry

2



By **Bill Schleicher**

Vice President and Editorial Director  
Hitchcock Publishing Co.

- ✓ *Union Squabble Mars Tool Show*
- ✓ *Quality Control Gains Stature*
- ✓ *Are Shows Worthwhile?*

■ Overshadowing the technical exhibits of the recent ASTME Show in Detroit was an unhappy labor situation. Many exhibitors would probably substitute the word "wretched" for "unhappy"; however this may be, one question was uppermost in the minds of the majority of exhibitors: is Detroit the city in which to hold a tool show?

Exhibitors were caught in the middle of a jurisdictional union squabble which resulted in exorbitant labor costs. Instances of exhibitors paying hundreds of dollars through the nose for help were common. In our own booth, a charge of \$40 was demanded for a piece of work which we performed ourselves in 15 minutes. Charges of extortion were heard from many quarters. Either the exhibitor paid up or his equipment was not placed in operation. "We were really held up," one angry exhibitor sizzled, "we had to pay through the nose or they wouldn't touch our stuff."

"This is my last show in Detroit," said another. Talk of exhibitors' refusals to return to Detroit unless the labor situation was resolved was heard from many people. Unless a more honest and hospitable attitude becomes evident, Cobo Hall, now being readied in downtown Detroit, and which is supposed to become

# U. S. Steel Supply Provides Customers with **SMOOTH ACCURATE SHEARING**

*One Shear Takes the Place of Two or Three*



No. 12E-12 Steelweld Shear at U. S. Steel Supply, Seattle, Washington, rated for steel plate 12" x  $\frac{3}{4}$ ". Being cut in photo is a plate, size 7" x 30" x  $\frac{3}{4}$ ". With hand crank on right end, this machine can be adjusted in a few seconds to have exactly the right knife clearance to obtain the finest cut for any thickness. To make this adjustment on guillotine-type shears usually requires several hours.

**M**ANY steel warehouses have two and often three shears, one of a  $\frac{1}{4}$ " capacity for lighter thicknesses, another of  $\frac{1}{2}$ " capacity for cutting  $\frac{1}{4}$ " to  $\frac{1}{2}$ " material, and a third with 1" capacity for thicknesses over  $\frac{1}{2}$ " and up to 1". At some of its warehouses, U. S. Steel Supply uses only one machine for cutting the various thicknesses—a Steelweld Pivoted-Blade Shear.

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because it is so easy to adjust the knife clearance required to obtain the best cuts for different thicknesses, which can range from lightest gauge metal to the heaviest plate within the capacity of the shear.

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## STEELWELD PIVOTED BLADE SHEARS

the country's finest exhibition hall, may turn into a \$54-million mausoleum. It does not take long for news of the ASTM's experience to chill the ardor of prospective associations who may have planned to hold shows in Detroit.

Significantly, neither Governor Williams of Michigan nor Mayor Miriani of Detroit were at the opening ceremonies, a splendidly hospitable attitude toward exhibitors and visitors who left \$2-million in Detroit during the run of the show.

■ Having covered tool shows for the last 20 years, we met many friends and saw many products which have become stand-bys in our industrial life. Sometimes one does not see too many new items, new in the sense that they embody new concepts or reflect original approaches to old problems. Improvements were visible in almost all of the products, new lines have been added, and on every hand were evidences of industry's demands for finer finishes and closer tolerances.

In the area of quality control, industry has had to provide tools and methods and the development of special gages, automatic size controls, built-in gaging systems and tools for the measuring of small holes and the determining of surface finishes to a millionth of an inch. Several automatic gaging machines, for they are more than mere gages, were in evidence at the show. Again, while they are not new as of last April, they tend to show the direction which gaging has taken. The proper setup on many critical jobs will be a ma-

chine tool from which the parts are automatically ejected into a gaging machine where they will be gaged and sorted and counted. We will, in the future, see much more of this sort of thing. Feedback, correcting the machine when the gaging mechanism tells it that parts are coming through defective, is available, and will be used more in the future.

As we see this sort of thing, we cannot help but agree with the General Motors engineers who maintain that this is merely advanced mechanization and should not be called automation, the latter being a pretty badly overworked word.

Hopper feeds, index tables and tools mounted above, below and around the work were, as in previous years, much in evidence. So much can be done with this sort of tooling that we are constantly surprised, when visiting plants, that more management people don't listen to their production and engineering personnel who want to install this type of equipment which is in the low-cost bracket.

■ From a technical standpoint and from the social aspects, which meant the meeting of many fine people and the renewing of old friendships, the show was a success. However, we did resent having to pay 20¢ for a cup of coffee. The food prices were not exactly realistic, but then, neither are they in Chicago. There is a feeling that an exhibitor and a show visitor are always ripe for a fleecing. One wonders if shows and exhibits are worth all of the bother, cost and headaches. . . .



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By **Harry Conn**  
Chief Engineer  
Scully-Jones & Co.  
Chicago, Illinois

# ENGINEERING and TOOLING



## Use Laws of Friction For Balanced Tool Life

■ There is a way to obtain better tool life *without* reducing the surface feet per minute or changing the work material specifications.

Sometimes improvements in tool life and workpiece finish can be made just by applying some of the basic laws of engineering or physics. For example, the 2nd law of friction also applies to metal cutting.

The second or classical law of friction states, "Friction is independent of the apparent or geometrical area of the sliding surface." The first law states that "Friction is proportional to the normal force or load." In other words if an automobile brake band of one inch width is increased to two inches, the amount of friction will be the same. The amount of friction will depend upon the force exerted by the brake band upon the brake drum. The two inch wide brake band will wear twice as long as the one inch wide brake band but will show the *same friction values* for corresponding forces or pressures.

In Figure 1, are two roughing cuts being taken on a conventional lathe. The first cut shows the side cutting

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Edge Angle called SCEA in cutting tool nomenclature to be  $0^\circ$ . The second cut shows that the SCEA has been changed to a  $45^\circ$  angle. This will present 41% more cutting tool to the work piece to absorb the friction of the cut. The friction will not be altered but, like the increased width of the brake band, it will have a larger area to absorb the friction and wear and will therefore show improved tool life. The per cent of increase in tool life will not be the increase in linear distance of the cutting edge, but it will be a very wholesome and adequate increase.

The SCEA should be increased and, of course, this is usually limited to the piece part, design and sequence of other cutting tools within an operation. Many turning tools used in England use a larger SCEA angle than

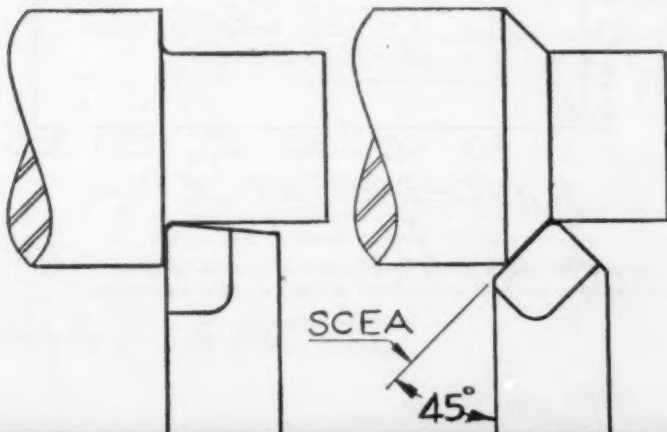
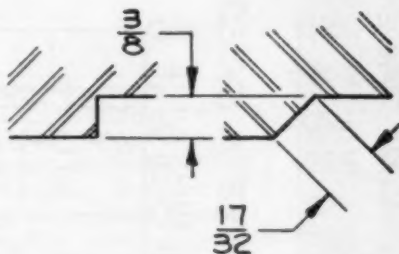
the  $45^\circ$  that seems to be acceptable in this country.

The application of these first two classical laws of friction can be applied to roughing cuts and some finishing cuts to obtain increased tool life. The first *law of wear* is supposed to be "wear rate is independent of the apparent area of contact." This law does not hold true in cutting tool life tests.

Metal cutting efficiency can often be improved by knowing the effect that speed, feed and depth of cut has upon tool life. Frederick W. Taylor discovered their effects many years ago but manufacturing engineers for the most part have not used his discoveries.

It isn't uncommon to see a part being turned by using two roughing cuts which, if combined, would still

1. Two roughing cuts, one with  $0^\circ$  side cutting edge angle and the other with  $45^\circ$ . This represents a 41% difference in area of the cutting tool to absorb the friction of the cut. Result is increased tool life.



use much less than the total horsepower available.

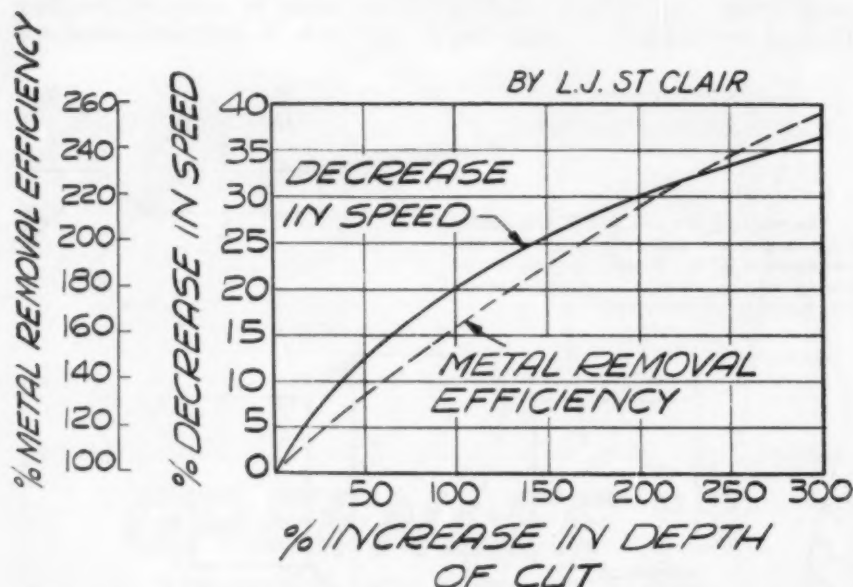
From Figure 2, we see that if a cut is doubled from  $\frac{1}{4}$ " to  $\frac{1}{2}$ " in depth the speed would only need to be decreased 20% to obtain the same tool life and the efficiency increased 64%. If the depth of cut was increased from .250" to .750" the speed would only have to be decreased 30% to be able to obtain the same tool life as the present speed. At the same time the efficiency of the cutting tool would be increased 120 per cent.

In many special machines the optimum speed is not determined nor affected by the roughing tools. Therefore many cuts could be doubled in depth, speed decreased to obtain

present tool life and one roughing cut eliminated. When the piece part is very rigid or stiff and efficient tool holders are used, the effect of depth of cut upon tool life is often less than that shown in Figure 2. In other words the values shown in Figure 2, are liberal.

By taking the deepest cut and a heavy feed with the most speed possible with existing horsepower capacity the most efficient cut is obtained for roughing cuts.

Minimum cost tool life should be computed by using "Optimation" equations but this article only shows the effect of depth of cut on tool life and SCEA effect upon tool life. • • •



2. By taking the deepest cut and a heavy feed with the most speed possible with existing horsepower capacity, the most efficient cut is obtained for roughing cuts.

By **Paul Prikos**  
Prikos & Becker Tool Co.

4

# THE PRACTICAL DIEMAKER



## An Effective Outline For Teaching Apprentice Die Makers

### Part 2

■ Entering the third year of die making, we expect the student to be capable of grasping more difficult projects. One thing of importance is to try to keep the actual shop training correlated with the theoretical instruction. One should not, however, expect the fledgling diemaker to build complete dies. In order to keep the student's interest high, related industrial movies about shop practice should be shown from time to time. The outline for instruction continues as follows:

#### THIRD YEAR OF APPRENTICESHIP

1. Cam dies
  - a. Principle and various types.
  - b. Theory of movement.
  - c. Typical cam action.
2. Combination of cam action dies with other operations.
  - a. Pierce top holes and side holes.
  - b. Internal cams—indent, emboss and forming.
  - c. Stripping methods.
3. Advance compound dies.
  - a. Sectional construction.

CREATIVE ENGINEERING

- b. Knockouts, yokes, keying and sinking into punch holder.
4. Shaving and Burnishing dies.
  - a. Theory and allowances.
  - b. Secondary dies and progressive shaving dies.
5. Progressive Die Problems.
  - a. Complete layout of a multi-step progressive die.
6. Introduction to Drill jigs.
  - a. Description and principles.
  - b. Various types: plate; open front; box or hex; leaf; cradle; indexing, etc.
  - c. Commercial parts used—bushing and the like.
7. Introduction to Fixtures.
  - a. Description and principles.
  - b. Various types: milling; grinding; turning; tapping; face plates; and vise jaws.
8. Introduction to Gages.
  - a. Description and principles.
  - b. Various types: plug; indicating; template; ring, etc.
  - c. Gage makes tolerances, X, Y, and Z classes.
9. Assembly tooling.
  - a. Riveting; staking; welding; alignment and other tooling for assembly.
10. Special stamping presses.
  - a. Eyelet machine versus progressive dies.
  - b. Transfer slides and presses.
  - c. Multi-slide and form slide machines for spring clips and similar parts.
11. Press brake dies and their uses.
  - a. Steels used.
  - b. Form, pierce and gang dies.
  - c. Catalogue with illustrated examples of actual applications.

We should bear in mind that any of the topics discussed in the third year training can become highly specialized fields. However, the trainee must be made cognizant that many facets of diemaking exist that he may never encounter during his career. • • •

Next month will be the third and final outline covering the final (4th) year in tool and die making apprenticeship training.



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By **Dennis G. Jones**  
Assistant Chief Engineer  
Kennametal Inc.

5

# CUTTING TOOLS



## WHY DO CUTTING TOOLS FAIL?

■ The cutting of metals by the chipmaking process must be defined as an art, because we do not fully understand why we are successful. Were it entirely understood then it would be completely scientific and we could calculate the results to be expected under any given set of operating conditions.

The great number of variables encountered in metal cutting are most difficult to evaluate and when combined, result in complex relationships that defy description in simple mathematical terms. This is why surface speed recommendations for cutting any metal or alloy are invariably stated as a range; 250 to 350 sfm, for instance. The optimum speed will be dependent on the relationship of the actual variables of the specific operations.

Each year, through metal cutting research, we move a little closer toward scientific solutions of the metal cutting problems. Sometimes our progress does not change the practice, it only serves to explain why we have been successful at what we have been doing.

One of the accepted principles of metal cutting is that

CREATIVE ENGINEERING

## *Up To A Point, Tool Wear Is Directly Proportional To Temperature, Then—*

the combination of a high rate of feed and a large depth of cut at a low cutting speed will allow the greatest amount of metal to be removed for a given tool life. With broad but finite parameters this principle can be proved mathematically. The mathematics involved are relatively simple and have been developed empirically. The actual formula is an extension of the Taylor equation:

$VT^n = C_t$  (1) and may be written

$$V_t = \frac{C_a}{d^x f^y} \quad (2)$$

In this form the  $V_t$  represents the speed at which a given tool life may be obtained.  $C_a$  is a constant dependent on machine and work material variables.  $d$  and  $f$  are the depth and feed, and  $x$  and  $y$  are exponents. Normally the average values of the exponents  $x$  and  $y$  are accepted as 0.24 and 0.43. The relatively low value of these exponents, particularly that of the depth, demonstrates mathematically why more metal can be removed for a given tool life by increasing the depth and feed than can be accomplished by increasing speed.

Recently, through metal cutting research, more evidence has been established to support the principle of increased feed and depth at moderate speeds. Work done by Professor K. J. Trigger and B. T. Chao of the University of Illinois on tool-chip interface

temperatures has revealed a close relationship between cutting speed, tool life and temperatures at the tool-chip interface.

It has long been known that temperature was closely related to tool life. In fact the terminal point of a tool was and still is frequently described as the time when the tool is "burned up." In high speed steel, the term "red hardness" is intended to describe the metallurgical property of retaining hardness at cutting temperatures. This term might also apply to cemented carbides but usually carbide fails through a more complex high-temperature phenomenon rather than just simple loss of hardness.

Professor Trigger concluded from his research that carbide tool wear is directly proportional to temperature until a certain temperature is reached. At this temperature, which he has defined as the "critical temperature" the wear rate changes abruptly and the tool quickly fails. The wear referred to here is specifically crater-wear, but current investigations indicate that the same phenomena apply for edge-wear.

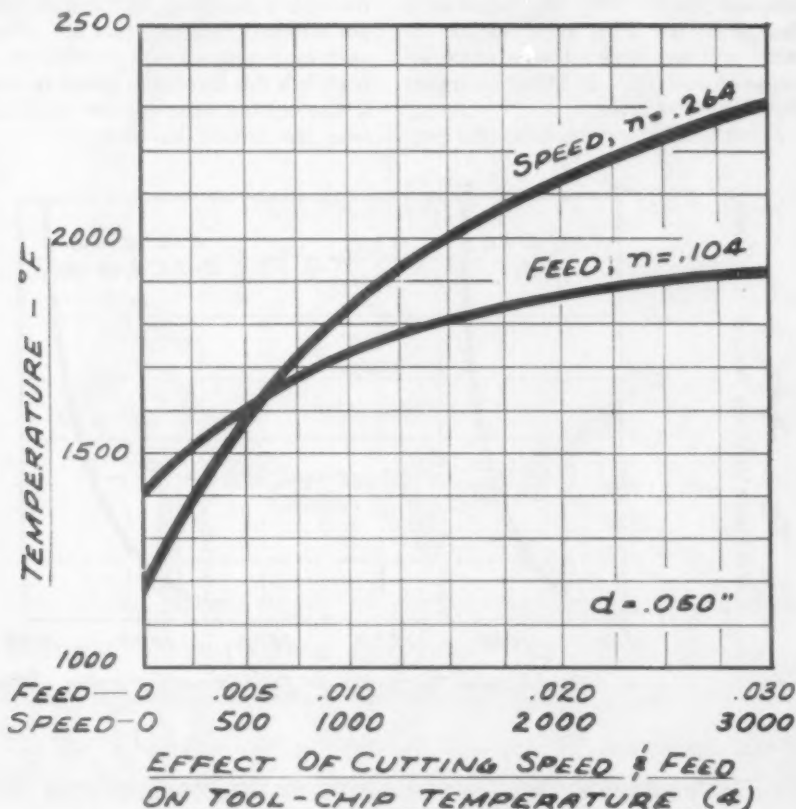
Since it has been demonstrated that temperature has a significant effect on tool wear it is in order to examine what relationship there is between feed, depth and speed and cutting temperatures. Depth of cut has negligible effect on the tool-chip interface temperature when the depth is any value greater than two times the nose

radius. It may be concluded therefore that depth is the least significant factor in cutting temperatures and in tool wear. This conclusion is supported by the low value of the exponent applied to the previously stated equation.

The speed and feed, however, have a much greater effect on cutting temperature and since they are usually the independent variables which are

most often manipulated in a cutting operation, a comparison of their effect on cutting temperature is of importance.

Figure 1 shows a plot of cutting temperature versus surface speed and feed rate. It is obvious that comparable changes in speed and feed do not produce comparable changes in temperature. This is evident from the value of the slope of the curves, 0.264



1. The plot of feed versus temperature and speed versus temperature graphically shows why feed has a less significant effect on cutting temperatures and corresponding tool life.

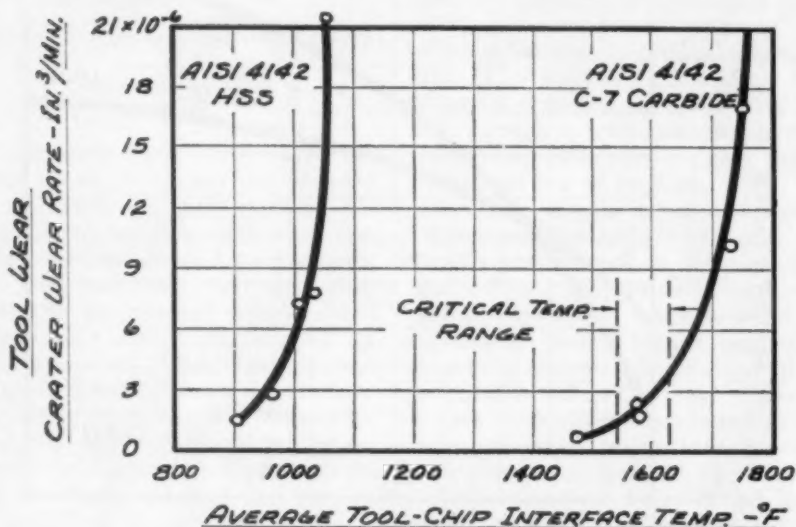
## CUTTING TOOLS continued

for speed and 0.104 for feed.

By arbitrarily selecting any set of conditions with respect to feed and speed it can readily be determined from the graph that if the speed is doubled the temperature increase will be approximately twice what it would be if the feed were correspondingly changed. A change, 250 to 500 sfm, for instance, will raise the cutting temperature about 200° F, whereas a change in the feed from .0025" to .005" will result in a temperature increase of only 100° F. Other examples show a similar ratio.

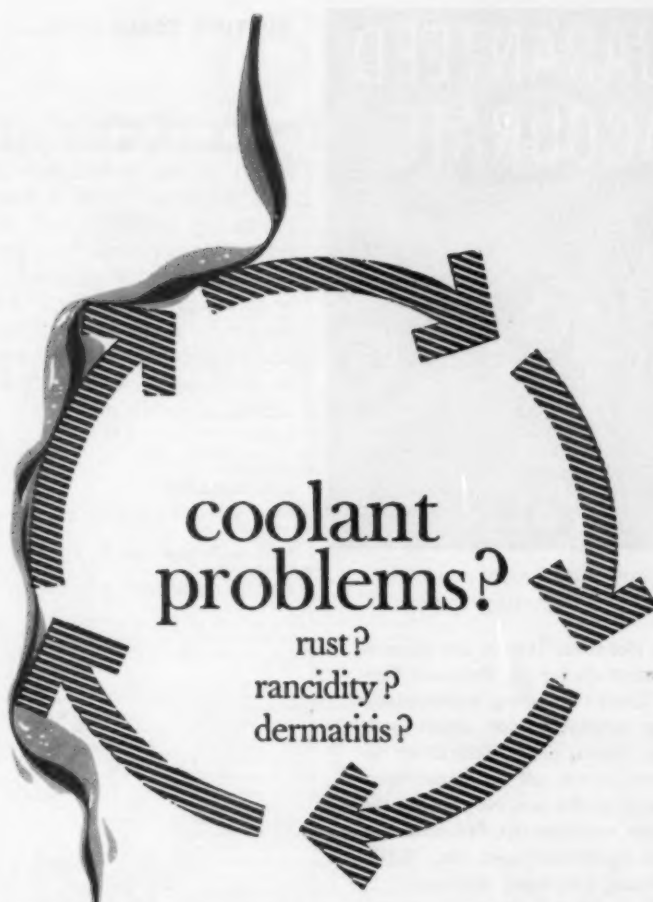
Since temperature, notably the pre-

viously defined "critical temperature" establishes an operating limit with respect to acceptable tool life, it is more desirable to increase the feed than the speed if a higher metal removal rate is desired. This procedure will, of course, affect tool life but not nearly as drastically as will comparable increases in speed. In other words, the metal removal rate may be doubled through a doubling of the feed while not seriously reducing tool life, whereas it may not even be possible to accomplish this through a speed increase if the cutting temperature is already near the critical value.



DEPENDENCY OF CRATER WEAR RATE ON AVERAGE TOOL-CHIP INTERFACE TEMPERATURE (3)

2. This plot of tool wear versus average tool-chip interface temperature reveals the abrupt change in tool wear when the critical temperature is reached.



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## CUTTING TOOLS continued

This relationship of cutting temperatures to tool life, speed, feed and depth of cut is therefore compatible with what has been a long-accepted operating principle and serves as a scientific explanation for what we know to be good practice. This type of metal cutting research is being conducted by many interested universities and corporations throughout the world to help make metal cutting a completely scientific and predictable operation.

• • •

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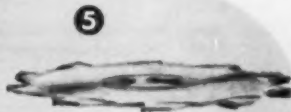
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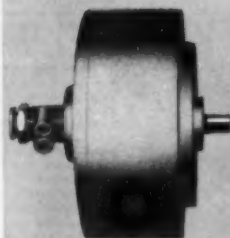
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6

# PROCESS ENGINEERING



## How Can You Be Certain That Your Manufacturing Method Is The Best Method Possible?

**PROBLEM**—As there is more than one way of skinning the cat, there is more than one way to manufacture a part.

**SOLUTION**—Sit down and figure costs for every method, then project costs versus quantity. The answer may surprise you.

■ Which method is best, given a choice, to produce a quantity of parts? When does one method of manufacture become more economical than another? Though many firm's engineers do not take the trouble to find out, various methods of fabrication should be analyzed to select the best method—based on desired production quantities.

To make a comparison, many things must first be known. These include estimated cost of the various tools, run time in pieces per hour, cost per piece for the various methods of fabrication, and setup costs. All of these known facts can then be charted and projected to determine what is the quantity of parts at which one method of

CREATIVE ENGINEERING

*The need for a new piece of production equipment may be revealed by compiling a break-even chart*

manufacture becomes economically better than another.

To illustrate the method of determining this "breakdown point," as it is called, the piece-part shown in Figure 1 will be used. This is a simple sheet metal part, made of .032" thick yellow brass. The physical operations needed to produce this part are to

pierce or drill the holes, notch or trim to shape the contour, and then form one side up 90 degrees.

Notching was chosen instead of blanking the part complete because the over-all tolerances on width and length are not tight enough to require blanking. A rectangular blank will be sheared to size, and then the further

Figure 1. This is the simple sheet metal part used here to illustrate how production requirements influence method of manufacture. Material is yellow brass, .032" thick.

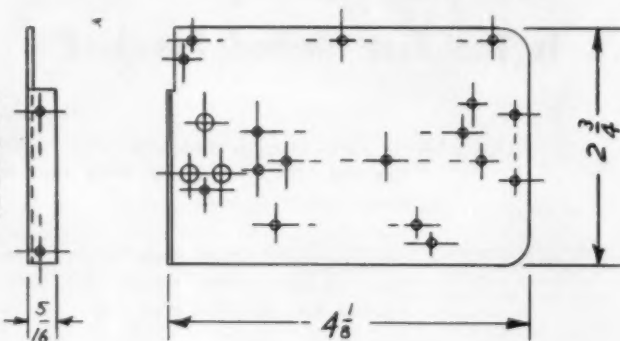
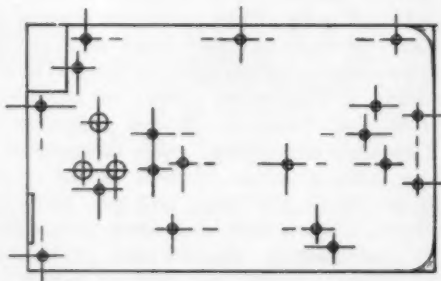


Figure 2. The same part, in the flat, with the areas to be notched indicated at the corners. Operations needed to produce this part are: pierce or drill the holes, notch or trim to shape the contour, form one side to 90°.



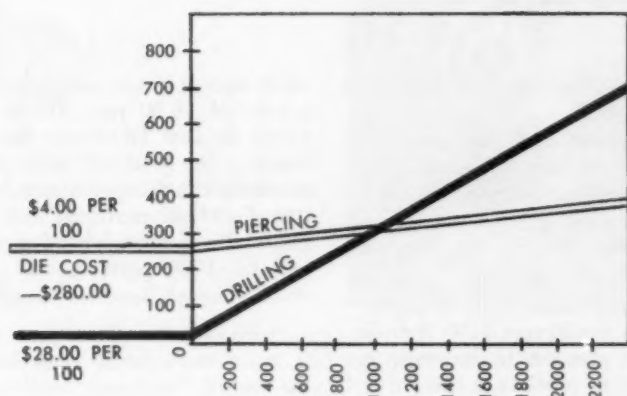


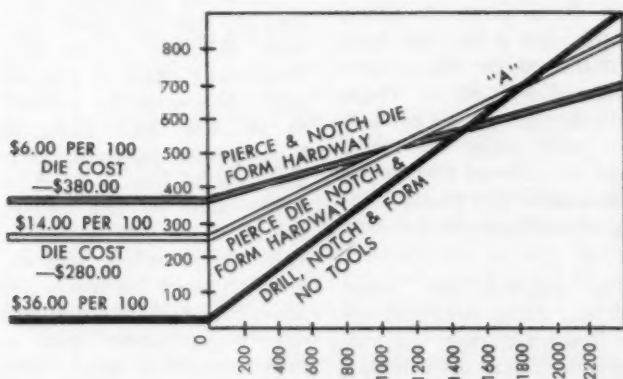
Figure 3.

fabrication will begin. Figure 2 shows the part in the flat with the areas to be pierced and notched shaded.

The graphs shown in Figures 3, 4, and 5 are used to indicate total cost in dollars (including tool cost) for various quantities of this part.

In Figure 3 one line indicates the cost of parts run on a numerically controlled drill press. This operation

is to drill all holes in the part, three parts in a stack. Another line indicates cost of producing the parts by piercing all the holes in a simple low cost piercing die. The holes can be drilled at a cost of \$28.00 per 100 with a very minimum allowance for tooling (preparation of the tape, programming, etc.). The cost per 100 parts in the piercing operation is \$4.00 but the



Figures 4 and 5.

cost of the pierce die (\$280.00) must be figured in.

This indicates that the first 1100 or so parts can best be produced on the drill press, but beyond that figure (where the lines cross) we can well afford a pierce die and the parts will cost much less in the total.

For a comparison then, a quantity of 600 parts would cost \$168 if drilled and \$304 if pierced. If, however, we should need to produce a quantity of 2000 parts, they would cost us \$560 if drilled and \$360 if pierced.

Figure 4 illustrates the comparison between various methods of producing a complete part, whereas Figure 3 deals with putting in the holes only. One line indicates a cost per 100 of \$36.00 for drilling in the tape controlled drill press, notching on standard equipment (no tools involved) and bending the lip in a press brake.

This method is economically sound until the intersection of the lines at "A" is reached, meaning that at a quantity of 200 we should at least make a pierce die to pierce the holes, and still notch and form the hard way. Cost of the pierce die, as previously mentioned is \$280.00. These two lines indicate that we are producing complete parts under the methods mentioned at a cost of \$36.00 per 100 by drilling and \$14.00 per 100 by piercing, in addition to the cost of the die.

Now let us consider the "Form Hardway" line. This method of manufacture indicates that we can add the expensive hardway notching operation to the pierce die for another

\$100 and produce completed parts at a cost of \$6.00 per 100 in addition to the die cost. Obviously then, we are beating the cost of both the other methods at a comparatively low quantity. For 1200 parts, we can beat the pierce die and notch hard-way method and for 1700 parts we can beat the drilling, notch hard-way method.

Note that the pierce and notch die is more economical than the pierce die, notch hard-way method at the point where it beats the drilling, or "no tools" method. This means to us that a die for piercing only would be uneconomical at any quantity for this part.

So far we have always considered bending the lip in a press brake, and up to a very high quantity this will prove to be the best way for this part. However, a more complicated formed part might be produced complete in a progressive die for a fairly low quantity. This *type* of graph would *indicate* what this quantity would be.

All of the foregoing figures are not actuals; they are used for reference only. Whether or not this type of "breakeven chart" is prepared, it certainly behooves the process engineer to at least think along these lines to determine feasibility of production methods he has in mind. A detailed study made on this format is sometimes necessary to prove the economic value of so-called hard-way or "no tools" type of fabrication, and oftentimes the need for a new piece of production equipment, such as numerically controlled machines, can be proven in this manner. • • •





"If any manufacturer wants to reduce his manufacturing costs with cost-cutting equipment he'll find the answer in Chicago this September."



7

## LEADERS OF THOUGHT IN INDUSTRY

### Alan C. Mattison

President, National Machine Tool Builders' Ass'n.,  
in an interview with **William F. Schleicher**

**Q.** *In the five years since the last Machine Tool Exposition, which direction have the builders taken in machine tool developments? Will we see the results of their five-year long effort in Chicago this September?*

**A.** Yes! You will see many new developments which are the fruition of five years of planning and designing.

Unquestionably, the glamour machine tools, such as numerically controlled machines, will be much in evidence. This tape controlled equipment can really perform when utilized wisely. You'll also see steps in the direction of the completely integrated process.

**Q.** *Completely integrated process?*

**A.** Where one machine performs various operations. I don't mean a special machine, but rather one machine tool where the tooling is so arranged that boring, drilling, milling, or other operations may be performed on a part without removing it from the machine.

There is a definite, but rarely thought of problem in the manufacturing of delicate instrument and missile parts. The problem comes up when handling these delicate parts



On the subject of productivity . . . "higher wages do not mean increased purchasing power, they simply mean higher costs and higher costs mean higher prices, resulting in inflation. The purchasing power can only come as a result of low-cost production."

through various operations and various machines and in transporting them all over the shop. To prevent damage to the delicate parts, special cushions, expensive trays and other ingenious and protective means must be used. Well, with a machine which performs several different kinds of operations on one part, much of this carting about is eliminated.

**Q. To say nothing of the increased productivity?**

A. That's right. You'll also see a fine display of special machine tools which have been designed for one particular job; furthermore, there'll be many tools, which are special, that can be adapted to several different jobs. There will also be many new ideas on standard machine tools.

**Q. What is the outstanding over-all development on standard machine tools?**

A. There will be fewer frills and less of the nonessential on standards. Basically, what every builder has tried to do is reduce the floor-to-floor-time. For many years the builders have done a fine job of removing metal—after all, that's what a machine is supposed to do. But like air travel, you can get to where you're going in a hurry, but it takes longer to get to the airport. Machines have, in some instances, suffered from the same malady—it's taken too long to get the part on and off the machine.

There's been a tremendous concentration in the past few years to reduce the handling time, before and after machining. This has spilled over into gaging and you'll see much automatic size control. Many machines will be equipped for this; however, if you don't want automatic sizing right away, provisions have been made on the machine so that it can be attached at a later date.

Our machining techniques are excellent; from now on we must reduce floor-to-floor time. Our tooling, or rather, the tooling of American industry is excellent, although we can do more with automatic loading and automatic setting-up.

**Q. Will we see developments along these lines at the Exposition?**

A. Yes, you definitely will. Everything the builders have tried to do in the last five years can be summed up by saying that industry must do a better job faster and it must do it cheaper.

Another aspect that's becoming more and more important is the cost of assembling. Here's one area that industry has not investigated thoroughly. Tremendous savings can be realized here.

**Q. How does this affect the builders and the machines we'll see?**

A. To improve assembly you must become as automatic as possible and apply the same labor-saving thinking to that phase as you have in the past applied to machining. This means, in turn, that parts must be of unvarying accuracy. Machines must produce to closer tolerances. Some of the larger transfer type machines are beginning to have several assembly operations built in. This will be expanded and it will be a big thing in the future.

**Q. There really is very little automatic assembling of mass produced products being done today. When one realizes that 50 to 70% of the manufacturing cost**

**of a part goes into assembling, one can appreciate that it is a big field.**

**What other areas will show improvement in standard tools?**

A. Basically, they will be in the area of higher quality, reduced maintenance, easier accessibility, and higher operating efficiency. Each manufacturer will have his own developments there and I cannot say exactly which specific direction the individual builders will take.

**Q. The machine tool industry has been hit by imports, hasn't it?**

A. Just as almost everyone else, yes. We've lost many of our foreign markets. America is pricing itself out of the world market, not only in machine tools but in many other industries as well. This is not getting any better, but is getting worse.

**Q. What do you think of the future regarding this situation?**



"America is pricing itself out of the world market, not only in machine tools but in many other industries as well."

## *Why isn't our economy benefiting*

A. We'd better wake up and get to work. And this means everyone! Unless we produce better and cheaper, unless we can start bringing our prices down, all of American industry is in for a rude awakening.

The Europeans think we have holes in our heads, increasing our prices

even while we increase productive efficiency.

The entire economy should benefit from higher efficiency. But that's not true today. There are two fallacies: One, a higher wage does not mean increased purchasing power, it simply means higher costs and higher costs

### *About Alan Mattison*

Alan C. Mattison, President of Mattison Machine Works, Rockford, Illinois, was born in Beloit, Wisconsin, where his grandfather, Chris Mattison, had founded the company in 1896. He follows his father and grandfather as president of the company.

Mr. Mattison attended Cornell University, graduating with a degree in mechanical engineering. His entire business career has been spent in the Mattison Machine Works. After gaining experience in the various departments of the company he was made president in 1948.

He is a Director of Cinrock Machinery Inc., AMTEA Corporation, Mattison-Greenlee Service Corporation, and the Illinois Manufacturers'

Association; and is a member of the Woodworking Machinery Manufacturers' Association, the American Society for Metals, the American Society of Mechanical Engineers, and the National Association of Accountants.

Active in local affairs, Mr. Mattison is president of the Rockford School Board, a Trustee of Rockford College, First Vice President of the Rockford Memorial Hospital, Director of Junior Achievement of Rockford, Inc., and Past President of the Rockford Chamber of Commerce.

Mr. Mattison was elected President of the National Machine Tool Builders' Association in November, 1959.

*from higher efficiency?*

mean higher prices, resulting in inflation. True purchasing power can only come as a result of low-cost production.

The second fallacy that we indulge in is to believe that the increases of productivity are entirely due to labor. We in the machine tool industry know that increases in productivity in recent years have been due almost entirely to advances in technology—to the development of machines, equipment and processes which have resulted in greater output per man-hour. Therefore, if we would stabilize wages and translate increased productivity into lower prices, we would place ourselves into a competitive world position again.

**Q. Are the Europeans beginning to face the same situation?**

**A.** Yes, in Germany labor is beginning to be restless. At the present time there is no unemployment in Germany which means that in labor the law of supply and demand will enter. Due to the shortage of labor the cost of labor will go up and as soon as this happens prices will advance and Germany will face the same situation of increased prices.



"Our machining techniques are excellent; from now on we must reduce floor-to-floor time."

**Q. Isn't Europe more material-cost and tooling-cost conscious?**

**A.** They have a material-cost problem and quality material is at a premium. Much of their effort is devoted to conserving material. Their tooling is also more expensive and because tooling saves labor (which is, relative to tooling, pretty cheap) they don't go in for it the way we do over here. For us, tooling is inexpensive in relation to labor cost and we will apply good tooling to bring labor costs down. If we can bring our labor costs down and European labor costs go up we will have a fighting chance. It won't be easy and it will still take a lot of hard work on our part.

**Q. Are American machine tool builders hampered by foreign import licenses, and taxes and tariffs?**

**A.** We were, several years ago, and still are, in spots, but most of these were removed when the Euro-

peans discovered that they were not necessary. Our prices are so high that Europeans removed the barriers.

**Q. Do you believe that tariffs and additional taxes on imported goods will help American industry?**

**A.** Speaking only from a personal standpoint, I would say that tariffs are not the real answer to the problem. We've got to become competitive again, our prices must come down. Once they do, we'll sell equipment in the world. Our American machine tools are still, from the over-all view, superior to the rest of the world which have copied many of our designs and ideas.

**Q. Some of our readers wonder why no foreign equipment is being shown at the forthcoming exposition.**

**A.** For only one good reason: There's not enough room! We actually don't have as much room as the American builders want. Everyone wanted more space, but it had to be judiciously allocated and controlled. If anyone thinks we're keeping foreign builders out for any other reason I want emphatically to state that the problem is one of space, and the size of the exhibition hall.



"We'd better wake up and get to work. And that means everyone!"

**Q. All in all, it should be a good show in September.**

**A.** It'll be a whale of a show. If any manufacturer wants to reduce his manufacturing costs with cost-cutting equipment, he'll find the answer in Chicago this September.

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Questions About The Machine Tool Exposition—1960 are answered in a booklet available from The National Machine Tool Builders' Association. If you plan on attending the show or are still undecided you will want a copy of this booklet. In addition to descriptions of why, what, and where, the booklet lists hotels and motels in Chicago and suburbs (with price ranges normally charged). Each booklet features tear-out Inquiry Time Saver Plate application forms and forms for obtaining Rapid Registration Cards. Send requests to National Machine Tool Builders' Association, 2139 Wisconsin Ave., N.W., Washington 7, D.C.



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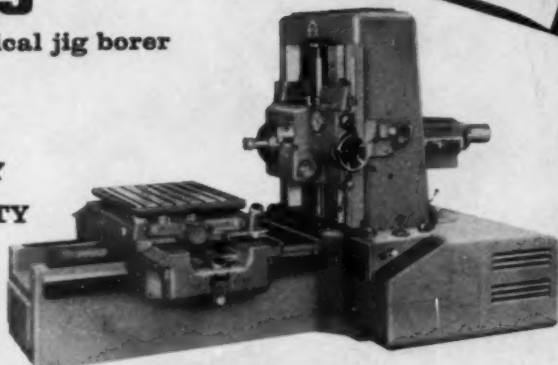
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## Nose Cones...

### A Study In Grinding Technique

*So fragile, hold down screws have pre-set torque ratchets; so accurate, variable wall thickness must be determined electronically.*

By **Darrell Ward**, Engineering Editor, in an interview with **M. E. Passmore**, Chief Process Engineer, Missile Systems Div., Raytheon Manufacturing Co., Bristol, Tennessee

■ Developments in the missile field are of such magnitude and so dramatic, that frequently specific engineering problems behind these developments become lost in the headlines. One such problem was the grinding of the ceramic nose cone of the Sparrow III missile.

The new missile is so fast that plastic and other synthetic materials will not withstand the generated heat of air friction, yet the nose cone must be made of non-metallic material to permit transmission of radar waves (hence its designation as the "Radome"). The part is made of aluminum oxide, "an extremely difficult material" to machine or grind to the exacting dimensional tolerances required.

How do you handle aluminum oxide ceramic grinding, especially in a part which requires considerable stock removal and turns up in irregular shapes as a result of kiln warping? The part is approximately 8" O.D. x 18" long, fired at 3150°F. Its hardness is 9 on the Moh scale, approximately equal to sapphire. Brittleness is the major problem in handling.

## *You can grind aluminum oxide like butter,*

The part comes in oversize from a West Coast vendor (Gladding-McBean). Approximately 0.050" of stock is to be removed on I.D. and O.D., but this varies considerably because of kiln warping.

Parts first are inspected for damage and for dimensional tolerances which will allow proper stock removal. They are shipped separately, but transferred to a 12-partition egg crate type dolly, figure 1, lined with polyfoam cushions, for handling in the Raytheon plant.

The part is chucked in a special holding fixture called a shuttle, figure 2. For preliminary locating, the part is suspended vertically from the center point inside the nose, then centered by four-cornered internal locators with carbide inserts. The locators are moved up and down on the I.D. until a barely snug fit centers the part. Then, the shuttle is brought down over the part and nested inside 3 hardened steel locators to center around the part.

Shuttle torque screws are tightened by means of pre-set torque ratchets which permit these screws to slip when slightly more than finger tightness is attained. Six screws grip the waist section, six on the skirt, and

three just back of the nose, figure 2. All 15 torque screws have a knurled-face brass clamping-pad which bears directly against the ceramic surface.

The clamped shuttle is removed from the locating fixture and turned on its side at the workbench, figure 2. An excess, approximately 1½" wide, of material projects beyond the shuttle and is later removed to true up the edge of the skirt and to bring the part to the correct length.

To retain this waste ring and avoid shattering when it is cut off, another fixture, called the cut-off ring, is brought into place against the bottom of the shuttle and clamped by means of six torque screws bearing against the surplus ring area, figure 2.

The chucked part then is ready for machining. The shuttle is lifted by a remote control overhead crane which serves six Heald No. 74 hydraulic tracer-controlled contour grinders.

The first operation is ring cut-off. The surplus ring is removed and a retaining plate is bolted to the shuttle to prevent the ceramic part from slipping out. After the ring is cut off, the skirt edge of the cone is faced so that 0.005" extends outside the shuttle face.

The shuttle is held in the machine

*if you know how to handle it.*

by means of a diaphragm chuck. The other end of the chuck is supported in the work position by two nylon bearings which ride against a precision bearing ring of the shuttle.

A longitudinal cross section through the Radome part shows the profile to be a true arc, not a generated shape. Therefore, machining is greatly

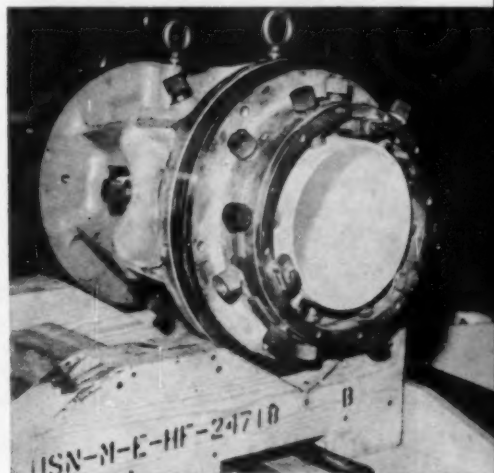
simplified, reducing the main problem to that of how to grind an extra hard ceramic and obtain a close tolerance profile. Continuous free cutting characteristics are essential.

The only wheel found to perform this internal grinding satisfactorily is a sintered matrix diamond wheel

*Good grinding technique starts with . . .*



1. SAFE HANDLING within the Raytheon plant by means of partitioned crates lined with polyfoam cushions.



2. MOUNTING the part in a special holding fixture called a shuttle. All 15 screws feature pre-set torque ratchets.

### *Infinite care each step of the way*

(Koebel Diamond Tool Co.) *normally made for wheel dressing.* A 3 $\frac{3}{8}$ " diameter wheel is used to remove between 0.015"-0.020" to within 0.001" of finished size in an average of four successive cuts.

Wheels are changed to a 1 $\frac{1}{8}$ " diameter, similar to the first, to reach farther into the nose. The first wheel travels approximately 13 $\frac{1}{2}$ " in from the skirt. The second overlaps and moves in approximately 4 $\frac{1}{4}$ " more toward the nose.



Wheels are changed again to a 1 $\frac{7}{8}$ " diameter wheel with a 3" radius on the periphery to blend previous grinds. This wheel brings the I.D. to final size within  $\pm 0.0005$ ". The workpiece is checked by means of an air gage on a radius arm, the latter being checked periodically with an Invar master gage.

Another tool, a core drill, reaches up into the nose and relieves the nose tip for cone wheel grinding.

The next step uses a cone wheel, contour pointed, to finish off the last 1 $\frac{1}{8}$ " inside surface at the Radome nose.

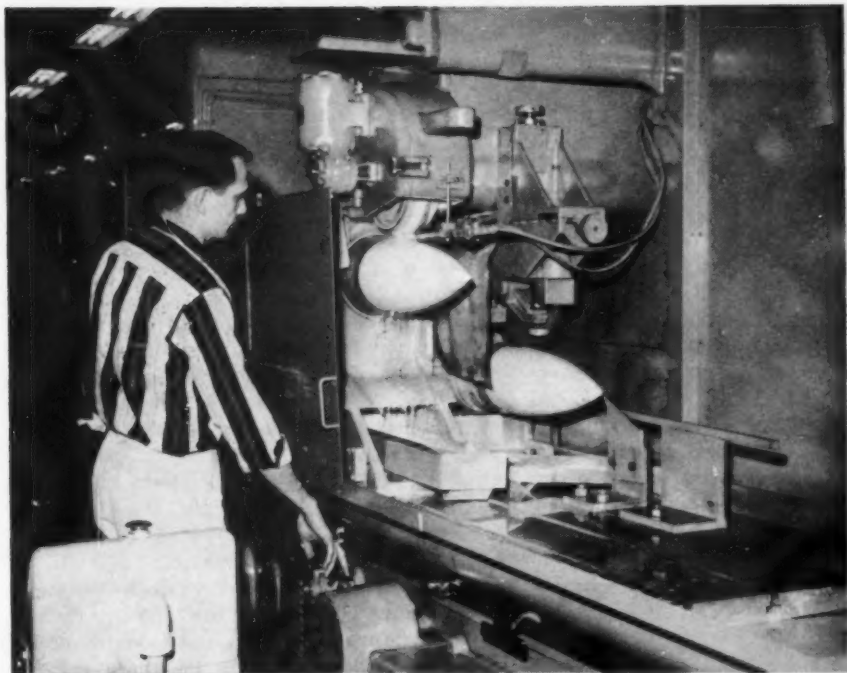
All operations are performed with a wheel spindle speed of 7,000 rpm. Infeed varies up to 1 ipm. The part rotates at either 62 or 115 rpm, according to wheel size.

The part is inspected while still in the shuttle by means of air gages and dial indicator bore gages before removing the shuttle from the machine (fig. 3).

External rough grinding is performed on one of four 30"x80"x32" Mattison hydraulic tracer-controlled profile grinders to remove 0.050" to 0.090" of stock, figure 4. Metallic bonded diamond wheels, 14"x $\frac{1}{2}$ ", at a spindle speed of 1750 rpm are fed

3. GAGING is performed while the fragile ceramic nose cone is still in its shuttle. Shown here, an air gage prior to inspection.





4. ROUGH GRINDING, on a Mattison hydraulic tracer-controlled profile grinder, is done with a metallic bonded diamond wheel. Workpiece is indexed 250 steps per revolution.

at approximately 1 ips. The workpiece is index rotated with 250 indexes for one full turn. A shift lever provides for indexing 1, 2 or 3 steps per machine stroke as desired.

These wheels also are stick dressed with a Norton Crystolon stick dresser, approximately once for every 25 workpieces.

External finish grinding is performed on a special Radome grinder developed by Mr. Passmore, Raytheon's Chief Process Engineer, and built by International Tool Co. of Dayton (figures 5 and 6). This machine takes advantage of the cone's

profile which is of true arc shape. The grinding head swings on a radius arm, whose length coincides with the projected radius of the Radome profile. Therefore, as the grinding wheel head moves back and forth with the part held in the headstock spindle, the proper shape is automatically developed. The cone is held on the mandrel by vacuum and released by air pressure.

Feed rate for finish grinding is variable up to about 3 ipm with an 8" wheel rotating at 2800 rpm. The wheel is 100 grit, 150 concentration. The face of the wheel, inherent in

*Patience and ingenuity are needed when grinding hard and brittle workpieces*

the operation of the machine, is normal to the contour surface of the Radome at all times and, therefore, produces a better quality of finish than would otherwise be obtained. Specified finish is 125 rms.

The special grinding machine now used as the finish grinder was originally designed for refinishing Radomes to pass the electronic inspection test. For an average grinding shop,

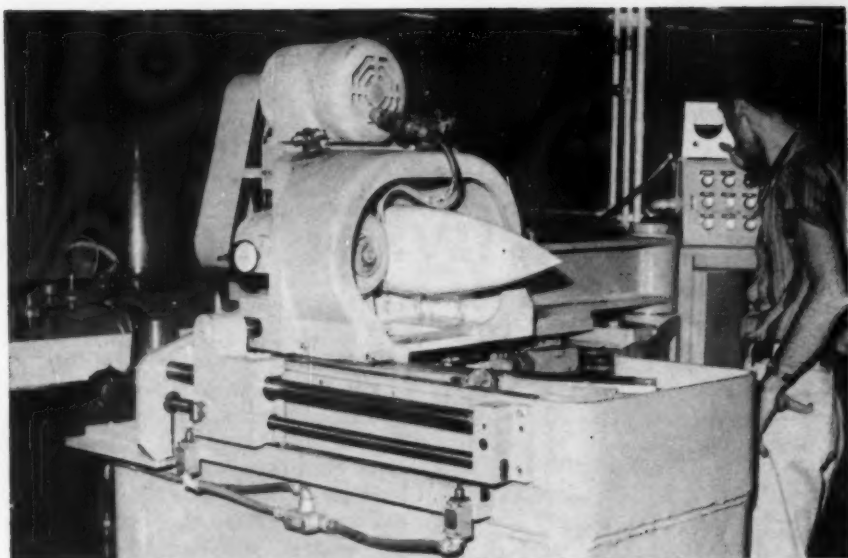
the tolerances required in the variable wall thickness would be unbelievable and beyond all normal shop practice.

While the specifications are not available for publication, it is sufficient to mention that at this point in finishing the Radome, even the best of standard gages are of no further use. Final testing depends entirely upon the dielectric characteristics of the ceramic, gaging being done by measurement of electromagnetic wave transmission through the Radome wall. Finish grinding must be gaged to the effective dielectric wall thickness, not to dimensional specifications. The Passmore grinder will perform this function, holding rejects to a minimum. And, most rejects from the first electronic test usually can be refinished to final tolerances.

Since most of what we observed in the plant, and many data normally discussed are classified, it is not permissible to disclose further information on this case history. However, Mr. Passmore was generous enough to sum up the basic problems encountered in the Radome contract and to throw out a few shop hints he discovered.

5. FINISH GRINDING is performed on a special grinder developed by Mr. Passmore. Note how grinding wheel swings on a radius arm to grind the cone's arc shaped profile.





6. FINAL GRINDING to size is achieved by measurement of electromagnetic wave transmission through the Radome's wall. The final thickness is the effective dielectric wall thickness, not to dimensional specifications.

The part is extraordinarily hard and brittle. Therefore, every precaution must be taken to avoid fracture. Wood work bench tops, wood cradles, foam padded stock dolly, and similar provisions around the shop have eliminated most handling hazards. The possibility of fracturing and the need for absolutely no distortion of the part in final grinding gave rise to the vacuum chucking method used on the Passmore grinder.

Because of the variable wall thickness and unusually close tolerance required, as well as the brittleness of the part which will permit no chatter, wheels must be trued to as nearly zero run-out as is physically possible.

In addition to this, the wheels must be very free cutting. The ones used at Raytheon are matrix relieved to

provide for this characteristic. Cim-cool was found to cut cleaner and freer than other coolants tested.

Matrices of the wheels must be kept extra clean to avoid build up and excessive pressures. Mr. Passmore found that when his wheels were cutting properly, they were bearing against the mandrel mounted part so lightly that the mandrels were deflected less under cutting pressure than they can be deflected by the pressure of a finger against the part. This was measured and demonstrated with sensitive dial indicators.

"Ceramic grinding of this kind is not as hard to do as most people think," Mr. Passmore said. "But, it requires more ingenuity and patience than many people are likely to exercise."

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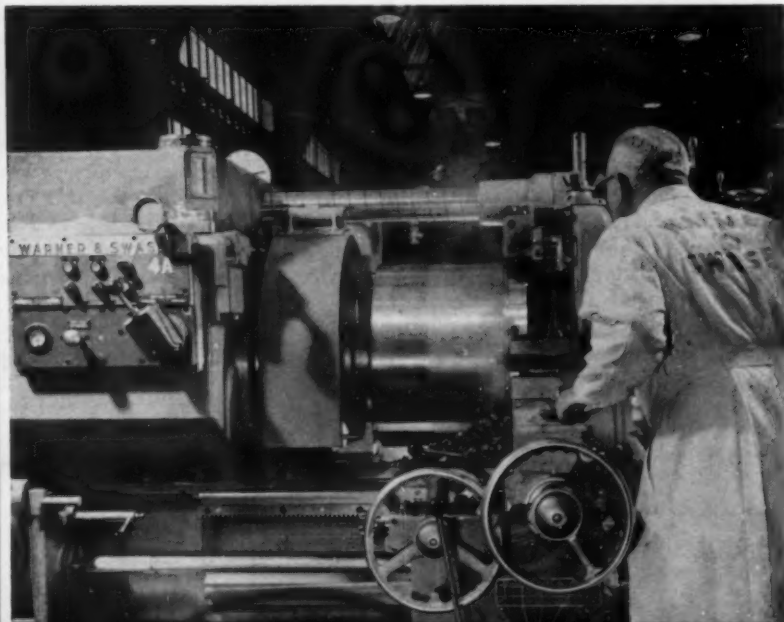
Everything else is running faster . . .

## Why Slow Down

■Cutting-off from bar stock, or "parting" as it is sometimes called, is one of those machining operations that is suddenly crying out for some kind of serious attention. The need for a new cut-off technique is critical; tooling for bar and chucker and multiple spindle machines has suddenly graduated into the carbide class. A whole series of operations will be hog tied by the cutting-off operation unless something is done to make carbide as effective in this aggravating

By Horace Frommelt

1. All tooled with carbide, but what about the cut-off blade?



# For The Cut-Off?

and irritating operation as it is in others.

Facing, turning, boring, plunge and other types of tools are now recognized, at long last, as entirely suitable for carbide. The latest versions of chucker, bar and multiple spindle machines are equipped spindle-speed wise as well as having power to take on carbide tooling; until unfortunately there is need for drilling or cutting off. Then, speeds must go back fifty years to accommodate the high speed cutting materials. In some of the later machines, of this class, the speeds of individual spindles are individualized, that is, they can be set separately and independently. Thus it becomes possible to run the customary 300 to 600 sfm for the traditional operations such as turning and boring, while hobbing, drilling, and cutting-off are run at the 60-100 range. Obviously there is much time lost here. In addition, the machine down time debit is increased solely because these tools will require more attention, particularly when up against tough materials such as the stainless 300 and 400 series.

The next step in this slow evolutionary process of rapid cut-off is the use of the brazed carbide cut-off tool. This is in the right direction but does



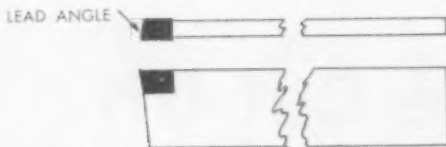
2. As cutting speed decreases towards the center, cutting forces rise tremendously. Good thing that the material gives way to the cut-off blade!

not go nearly far enough. Again the difficulty arises from the fact that when clamped-on indexable tools are used for the other operations, then the brazed tool cries out for attention about twice as often as the clamped-on variety. Where can we go from here to get better economic results?

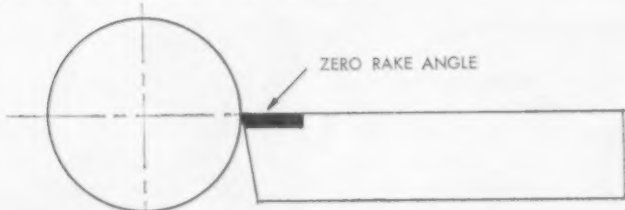
## **The Answer Lies In The Problem**

Before discussing the latest developments along the lines of cut-off tooling a look at the technical problem involved in parting will help. A look at Figure 2 brings home the problem immediately. A sfm rate is chosen—and here let us suppose in the neighborhood of 300-500 for this material and the type of carbide, etc. For the outer circumference this sfm

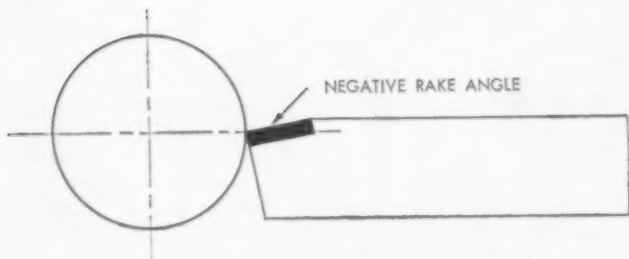
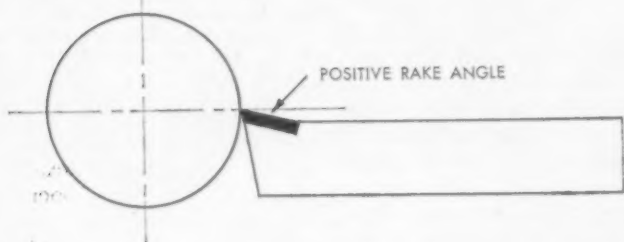
## Your choice of tool geometry is important



3. A slight lead angle should be used to ease the blade into the cut. Pressures are easier on the machine, too.



4. Zero rake is standard for cut-off tools.



5. Non-ferrous materials? Maybe the positive rake will perform better. Ferrous materials might find the negative rake a better performer. Type of machine used has an influencing affect on selection of tool geometry.



rate will be proper and fitting; but as the tool moves toward the center the sfm rate drops off, continuously adding difficulties with each infinitesimal drop in the feet per minute rate of parting. As the center is approached, where the speed is mathematically zero, the pressure will rise towards infinity. Before the center is reached by the parting tool, the cutting pressure has increased to the point where the material lets go—if the tool has not already done so—leaving the little telltale "tit." See Figure 2.

Such shenanigans are obviously devastating to any cutting material, particularly to carbide. Compromises must be made between maximum and minimum, but the plain fact to be faced is this: as the tool reaches center or close to it the pressures are unconscionably high. Thanks to present day carbide the workpiece lets go first and the tool stands up, not as long as it should but reasonably so.

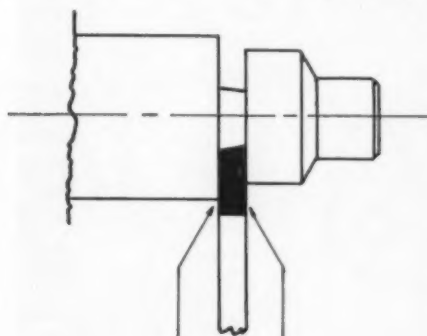
Under the stressed condition of the carbide due to brazing, the parting

operation demands attention three to four and more times than do other tools. What is being done for the harassed productionist? Another look at some of the parting tool geometry, that by experience and common sense has proven worthy of consideration, will be helpful.

### Tool Geometry Equally Important

A slight "lead" angle should always be incorporated into the grind, as shown in Figure 3. Here the blow to the edge is applied gradually; the lead point enters first and then, by degrees, the entire cutting edge of the parting tool. Whereas with a no-lead tool, the entire edge is slammed into the work with resultant terrific shock to the tool and the entire mechanism.

Usually a zero angle tool signature is employed, as shown in Figure 4, on cut-off tools. This is generally acceptable, however, the following exceptions might profitably be noted: A positive angle as shown in Figure 5 may be specified but apparently only seldom is, and then on special non-ferrous materials. The tendency for the tool to "grab" the work piece (the bar) is frequent, with bad results all around. In spite of the obvious disadvantages of the negative angle, it is frequently specified for ferrous (and special materials such as the stainless) and other austenitic, non-magnetic components. The plain and obvious advantage is the "pushing away" of the workpiece from the tool and the elimination of the cutting-off or parting tool's tendency to "grab." Much of this must be played by ear—as you go on into the jobs the way



ZERO SIDE RAKE ANGLE

6. Side rake for the cut-off tool should be zero to prevent tool wander during the cut as pressure increases.

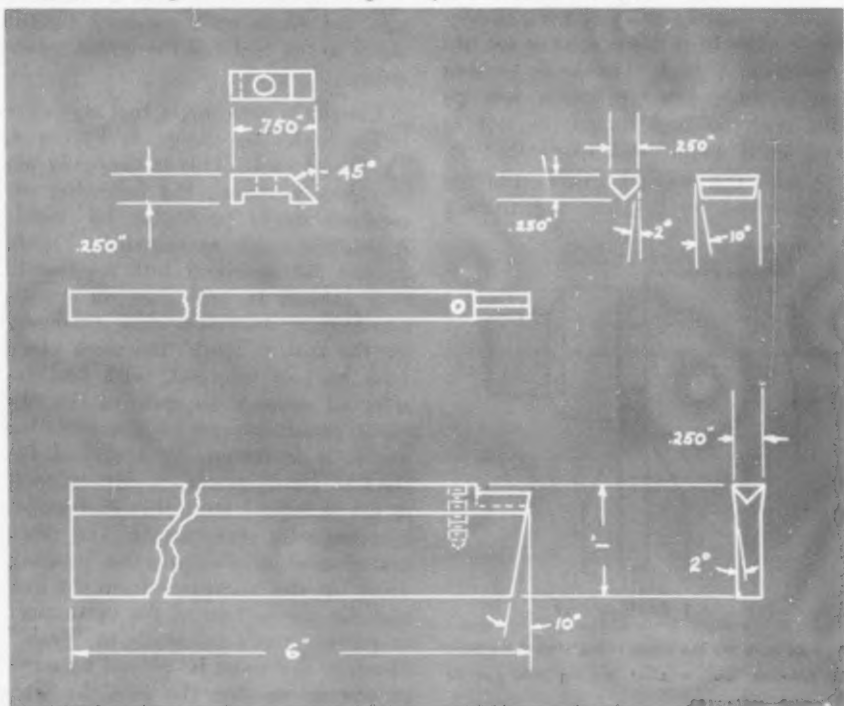
*Cut-off tool of the future, with*

will be indicated so far as angles are concerned.

Apparently, and this is from experience, the choice of cutting angles, whether zero, positive or negative, will depend to some extent on the type, kind and condition of the bar,

chucker or multiple spindle machine. Some machine tool mal-adjustments may be countered simply by employing a negative angle on the cutting tool; though this is a poor way and excuse for not keeping a machine in adjustment.

7. Toolholder designed to take advantage of special indexable carbide inserts.



## *indexable carbide blades!*

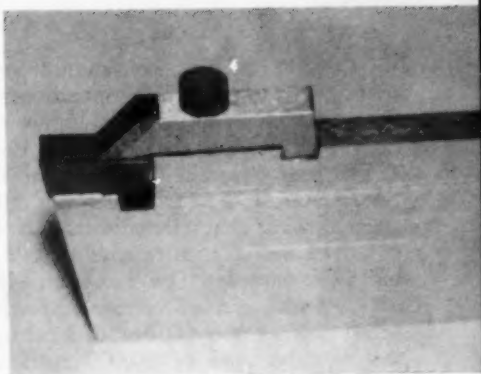
### **How About Side Rake?**

The next important piece of tool geometry to remember in cutting off or parting is the elimination of the side rake. This is shown in Figure 6. Clearances along the sides of the cutting element are specified only for grooving tools, rarely for parting tools.

The apparent justification runs something like this: The tendency for the parting tool to "walk" in the cut, shifting pressure from one side to the other with harmful side cutting pressures on the carbide, makes it necessary to keep clearance out of the side edges of the parting tool. This latter is a must: No clearance for the side cutting edges of the parting tool!

### **The "Ideal" Explained**

And now before going on to the latest development in parting tools using clamped-on carbides, an observation concerning a much-needed development machine tool wise may be in order. No matter what is or will be done to make parting a better job and give it some metal cutting religion, it will always be a wayward child. No amount of doctoring will eliminate the plain, unnatural, untechnical aspect of this kind of cutting—namely where the sfm rate decreases towards the center.



8. Not just theory; here's one ready to use.

And it is in the very nature of the beast that it so remains. There is a solution but that depends on the machine tool designers. The only sensible method of cutting off is by sawing. Today with the solid carbide saw available in thicknesses down to 1/32" such a tool would be a god-send on every bar, chucker and multiple spindle machine. Obviously there are difficulties: the saw must be set up on some form of cross slide to feed into the bar or workpiece. The problem of space is paramount and is recognized. But with some thought devoted to this problem, the current difficulties in the operation of these multiple spindle and multiple head machines will be, if not eliminated, at least reduced.

### **Clamped Carbide Inserts**

Since the addition of a cut off saw, separately driven and separately fed (all automatically arranged) is far off in the distance, let us take the next best solution: the parting tool with clamped-on carbide. Thus the vexing operation of slugging or parting will

be brought in line, considerably at least, with other carbide operations—facing, turning, boring, etc. Figure 8 shows such a tool that has been designed and tested with good results. A close-up of the tool will bring out the following characteristics: this is a  $\frac{1}{4}$ " kerf tool for parting with solid, indexable carbides. The shank is made of a special mix of copper impregnated powder iron (CIPI), of a psi in the neighborhood of 90,000 sufficiently strong for all pressures to which these tools are subjected. The clamp is integral with the chip breaker, a piece of carbide brazed to the clamp serving for this purpose. A 6-32 hold-down screw does the job, as proven in shop applications. Note from Figure 7 that the carbide nests in a V-pocket. This prevents tacking and sideways movement. The carbide blade obviously can be indexed once; two edges can be used. Grinding of the edges can be resorted to but only if the blade is backed up after shortening. If not so held, it will move in the cut to the damage of the blade, holder and perhaps the workpiece.

#### **All Should End Together!**

With this type of parting tool, the cycling time is brought into synchronism with the other operations. Thus troublesome downtime is held to

a minimum. It is even preferable, from experience, to sacrifice something in sfm rate for all the tools, say 15% less, and thus bring the wear point for all tools at about the same time on the time curve or cycle. So important is this downtime on an expensive multiple machine that it is better at times to slightly sacrifice speed on all operations to bring the tool life time of all tools in the multiple set-up together and coinciding. The obvious advantages of the non-stressed carbide blade over the brazed tool need not be elaborated on here. In practice the data proves the advantages and the necessity for doing something about this cut off business.

#### **What About Drilling?**

If only something could be done with the century-old business of drilling to get away from the "lazing" speeds of high speed steel drill as compared with the other tools that have been given a dose of carbide religion! So far nothing is on the horizon. The machine tool designers have come up with the assist of making spindle speeds independently variable. Thus the drill can be operated in the 60-100 range while the other spindles are running at 400-500 or better. Thanks for this improvement over tradition!

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## Conclusion

# What Do You Bend On A Bender ?

*Wrinkling, flattening, and distortion due to material variation are unnecessary and can be cured easily*

By **Darrell Ward**, Engineering Editor

■ One of the more interesting bending problems in round tubing which looks rather simple on the surface is far from simple in either principle or in practice. This is the job of bending clad tubing. Clad tubing is required for a variety of products, usually to impart internal strength with economy to a structural member and retain external appearance or protection without the high cost of solid material. An example is found in the highly polished stainless hand rails used in buses. Solid stainless tubing would be too costly and plating wears too quickly. The solution is clad tube parts made by forming a base metal tube inside the stainless and bending the two together.

This simple job presents difficult problems—the dissimilar metals do not bend together under the same stress or with similar reactions. Even if the materials were the same, the outer tube would move at a different rate from the inner tube. And, in this case, the outer tube is of much thinner wall construction because of its cost. The combination of thinner wall and different metals makes it difficult to prevent wrinkles from forming during a bend.

*Basic tooling can be in excellent condition and still produce flattening problems if the mandrel is improperly adjusted or improperly chosen*

A similar problem was found in automobile tailpipes made of laminated construction. These were designed to deaden the sound. They solve acoustical problems nicely, but produce serious problems for production.

How do you bend two different tubes of different cross sections and wall thicknesses together to make a smooth curve in the part? It was found that much higher pressures were required, and the diameter of the tubing *must be somewhat reduced to make both inner and outer tubes stretch into the new shape.* Otherwise, excess slippage and wrinkles would appear. The tailpipe problem was solved on a bending press with a specially developed punch die and unusually high pressure on the wing dies. A beefed-up machine can be adapted to the job with special dies for the purpose.

#### **Heavy Equipment Not Necessary**

The stainless clad tube of smaller size is bent by many firms on a simple draw bender with the addition of a wiper die. This die would not normally be required for bends in ordinary tube of the same size and radius of bend. In this case the wiper die prevented wrinkling of the very thin outer tubing without reducing the diameter.

With or without the problems found in bending clad tubing, the wiper die

requires proper attention. The adjustment of a wiper die varies in the same setup for different materials.

In bending aluminum, for example, there is a problem with the low tensile strength of this material. With aluminum, too much pressure between wiper die and pressure die may make the workpiece pull apart as the bend progresses due to excessive friction.

To relieve this friction under high pressure, but still support the workpiece just behind the tangent point on the inside of the bend and prevent wrinkles, the wiper die would normally be "heeled out" about 2° to 5° off of true tangent (Fig. 1). It would not be quite parallel to the pressure die. This presents a taper entry for the workpiece, eliminating much friction along the length of the wiper die, but still offering necessary support near the tangent point where wrinkles begin to form.

Stainless steel presents a different problem. For stainless, the wiper die will normally be set in true alignment, parallel with the pressure die, with no heel angle. This is made necessary because of the column strength of stainless.

Instead of flowing into compression to make a thicker wall on the inside of a bend, stainless is tough enough to push itself back into the tangent behind the bend and form wrinkles at some distance behind the tangent point. Much more support is required.



This is provided by the full length of a wiper die set exactly parallel with the pressure die.

### How To Set The Wiper Die

A suggestion for setting up the wiper die in proper alignment is to use a piece of solid bar stock ground to the same size as the workpiece to be bent. Clamp this master bar in place and run up the pressure die into position. *Do not rotate the bending die.*

With the setup bar in place, set the wiper die behind the bending form against the bar and bolt it down firmly.

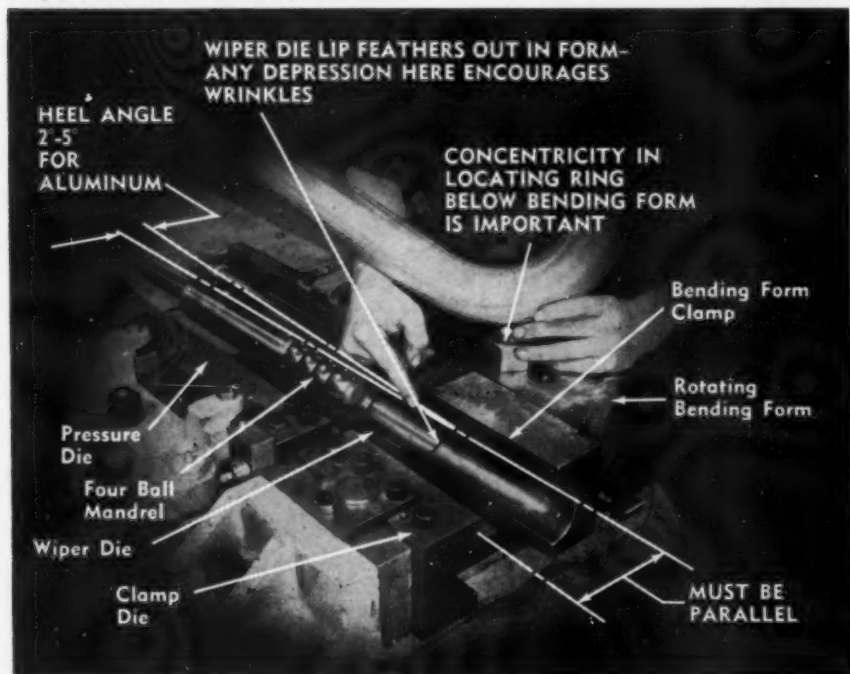
Now, unclamp the clamp and pressure die to remove the solid bar. This

setup should be *correct for stainless*. For softer materials, especially aluminum and some of the mild metals, the wiper die should be heeled over from  $2^\circ$  to  $5^\circ$  for the first test bend.

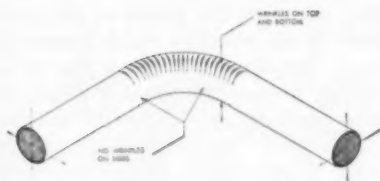
If wrinkles occur inside the bend area, increase the *pressure die pressure*. If no wrinkles occur inside the bend, but do occur along the wiper die just behind the tangent point, *reduce the heel angle* slightly less but not to zero. Adjustment should be made in increments of one degree or less until the wrinkles disappear and a smooth bend is obtained.

The heel angle should be *increased in proportion to the softness* of the workpiece material. This is to mini-

1—Complete set of tooling for typical tube bending opened up to identify each of the components discussed in this article.



## *Hand fit new wiper dies for wrinkle-free bends and to increase the life of the die*



2—Wrinkles will appear on top and bottom sides of bend, not along inner and outer radii of bend, when excessive die tolerance occurs as a result of under-size tubing.

mize friction and avoid exceeding the ultimate tensile strength of the work-piece.

The harder the material, the more there is a tendency for the material to push itself back into wrinkles behind the tangent point when the bend is made. Therefore, the heel angle is *reduced in proportion to the hardness and toughness of the material up to that of stainless which requires full pressure against a parallel wiper die.*

It is desirable to heel over as much as possible to reduce friction, bending pressure, and the amount of power required.

### **Gap Between Lip And Tangent**

In all positions of adjustment, it is desirable to have the lip of the wiper die come as close to the tangent point as possible. The lip cannot extend all the way because it cannot be feasibly feathered out to zero thickness. There will always be some gap (Fig. 7). This gap between wiper die lip and tangent point on the bending form is a troublesome factor. The gap appears right

where wrinkling begins. The larger the radius of the bending form, the bigger the gap. This explains why there is always a question of the best compromise between more support with greater friction vs. less friction and more likelihood of wrinkling.

Another factor enters the picture when you change the radius of a bend to be made. Mathematically, the gap between wiper die lip and tangent point of the bending form will increase as the radius becomes larger. In tooling up for a 2" tube bent to a 1" diameter radius (2" centerline radius), the minimum taper thickness of a wiper die would allow a relatively small gap of about  $\frac{1}{8}$ ". But, in a set of tools for a 6" or 7" radius, the gap distance may be as much as  $\frac{1}{2}$ ".

It is fortunate that as the gap distance must increase geometrically, the larger radius bend will have less tendency to wrinkle. The two factors are somewhat self-compensating.

But, this is assuming that the heel angle is not involved. As long as the heel angle is involved, and even on tight radius bends without a heel angle set on the wiper die, it is important to make the gap as small as possible.

### **What About The Gap Distance?**

Hand fit new wiper dies for wrinkle-free bends and to increase the life of the die with a minimum of maintenance. Here's how:

Mount the bending form and pressure die on your machine as for bending. *Do not* mount the clamp die or its holder.

Coat the tube groove of the bending form with prussian blue from the tangent point back.

Clamp a master bar between the bending form and pressure die. A master bar can be made from a straight length of cold rolled steel, centerless ground to the O.D. of the work-piece with nominal tolerances of plus .000", minus .002". It should have a ground finish and be slightly longer than the combined length of clamp and pressure dies.

Rotate the swinging arm to 25° or 30° so the wiper die lip will not be fitted to the joint between the straight clamping insert and the curved portion of the bending die.

Place the wiper die against the master bar and slide it gently forward against the bending form. Tap lightly. Remove. Observe the blue marks on

the wiper die which indicate the contact points.

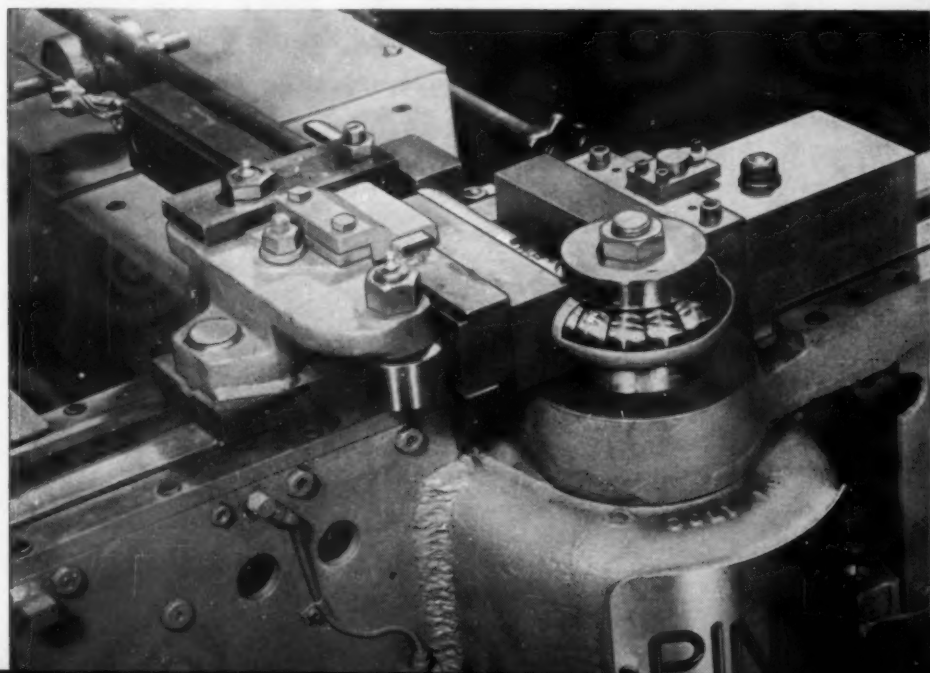
Rest the wiper die like a saddle on a piece of tubing to be bent, and hand grind off the high points. Repeat until at least 75% of the wiper die contact area shows blue from the bending form groove.

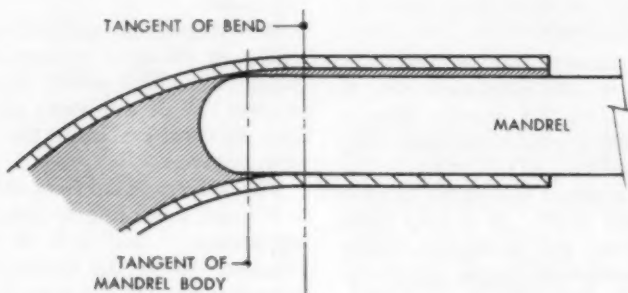
The job may take from 30 minutes to 8 hours according to size, machining accuracy, and skill of operator. But, once done, the feathered lip of the wiper die will come as close to the tangent point as would be possible. This is the only practical way to reduce the gap distance and, at the same time, get far better service from your tools.

#### **Variations In Commercial Tubes**

But, let's assume that tooling is good and everything is in order for a given nominal size of stock tubing. Then,

3—Action of a ball mandrel can be seen here with part of tube wall cut away inside bend area.





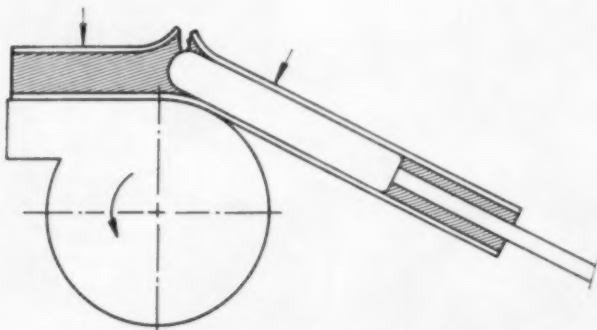
4—A slightly undersize plug mandrel is set beyond the bend tangent point to provide support to the inside of the tube. Tip setting is governed by sharpness of bend and clearance between mandrel body and inside diameter of tube.

you get a supply of tubing which, because of commercial tolerances, varies considerably from your nominal size. You may have too much interference, or there may be too much clearance between workpiece and tools. What are you supposed to do?

In the first place, with today's modern manufacturing techniques nearly all tubing is produced closer to

nominal diameter than stated in commercial tolerance specifications. Bending dies are made to fit the actual material to be bent, not the stated tolerances. One of your first actions on discovering your material varies considerably in size is to check your source of supply.

Even with close size control some slight variation will occur. In most



5—If plug mandrel is advanced too far, it will burst through the outer wall and fracture the tube as it bends. Arrows show pressure exerted by clamp die and pressure die, and direction of rotation on form die.

round tubing this slight difference is usually not enough to affect the quality of bends produced on a set of tools. In some instances, where material sizes tolerances are difficult to hold, as in square tubing, or where flattening and thinning must be rigidly controlled, manufacturers keep several different sizes of mandrels on hand. As a machine operator finds a workpiece over- or under-size he sets it aside rather than attempting to bend it. Later he installs the correct size mandrel and runs his off-size material with little trouble.

#### Some Make Allowance For Error

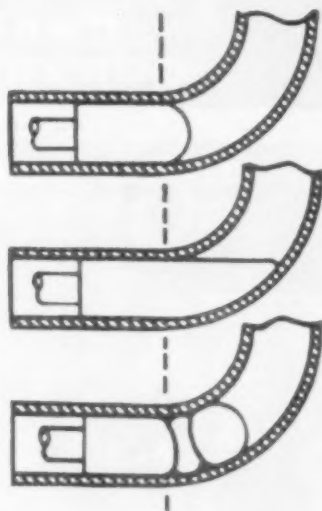
Close control of material sizes is an area of bending that has been overlooked in many plants. Instead these plants have written specifications with allowances for certain minimum wrinkling, flattening, and distortion. This questionable situation is not to be blamed on false economy or bad tooling. It is simply misunderstanding of the causes of imperfect bends in certain materials or certain machines with certain dies for certain radii.

Wrinkling, flattening, and distortion due to material variation are unnecessary and can be cured when you know the causes. When attempting to bend material that is less than nominal diameter the tolerance between the die and the work becomes more generous and wrinkles will tend to occur, not along the inner or outer walls of the bend, but along the sides. (Fig. 2). When a mandrel is in use this material will be difficult to load and will cause excessive mandrel wear. An under-size mandrel, well lubricated and correctly adjusted may enable production to continue while on-size mandrel is being procured.

Over-size material will tend to flatten, and the bending dies may even pinch distortion marks into the bends. If a mandrel is necessary one that is over-size, plus slightly less clamp and pressure die force, may enable continued production.

#### Tool Wear Introduces Problems

Bending problems may develop and lead one to suspect other sources of trouble when it is nothing more than normal tool wear. Rotating concentricity between the tube groove of the bending form and the machine spindle, as a good example, must be held within close tolerances (Fig. 1). A few thousandths eccentricity will re-



6—Normal depth of support provided by different standard mandrels. The plug mandrel offers least support to the I.D. of workpiece, ball mandrel the most. The form mandrel is desirable as a compromise between not enough support with a plug mandrel and the cost too high with a ball mandrel.

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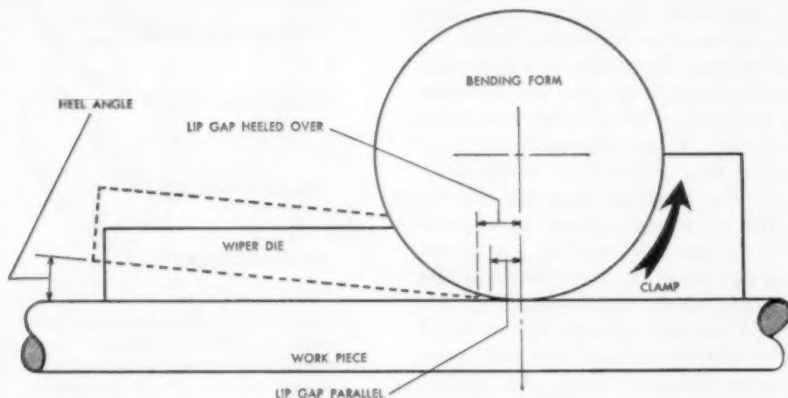
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## WHAT DO YOU BEND? continued



7—There is always some gap between the tangent point and the lip of the wiper die because the edge of the lip can never feather out to zero. Lip gap increases with longer taper of feathered edge for larger radii bends, also when wiper die is heeled over for bending soft metals.



sult in obvious camming action as the form rotates. If this happens, the workpiece can either be squeezed out of shape or may slip, depending on whether the camming is toward or away from the pivot point.

This problem is of concern not only to those making their own set of tools, but to every production operator. As the bearing area wears on the bending form, such camming action can become a problem in perfectly made tools which are worked beyond normal wear capacity.

#### **Protect Your Ball Mandrels**

Expensive ball mandrels can become the victims of excessive die wear. When using ball mandrels to make close radius bends, proper alignment and mounting of rod supports and guides are important to prevent damage to both tubing and mandrels. (Fig. 3)

But, another important point to remember is that the clamp die and bending form grip the tube over the mandrel balls. This means that if the circular cross section of the tubing is deformed in the clamping area by worn or an incorrectly machined clamp surface, the tubing may bind on the mandrel balls.

Since the mandrel is held stationary while the tubing moves over the balls during the bend, excessive binding will cause broken tubing or a broken mandrel.

To determine if the clamp surfaces are worn or incorrectly machined, clamp in the machine a short piece of tubing which moves freely over the mandrel. Let the tubing extend about 1" in front of the dies. Slide the free mandrel into the tube from the front to determine if there is

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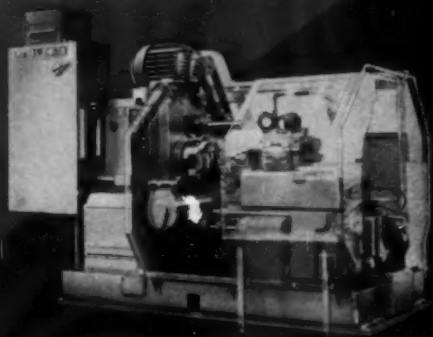
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#### WHAT DO YOU BEND? continued

enough clearance for the balls.

If the mandrel cannot be moved easily into the tube, there is deformation taking place and the balls will be locked into the tubing during a bend. This will cause wrinkles, tube breakage, or mandrel damage.

Make sure the grooves in the clamp die and bending form are large enough. And, you might try less clamp pressure to overcome the problem.

#### Must Be Correctly Adjusted

Basic tooling can be in excellent condition and still produce flattening problems if the mandrel is improperly adjusted or if the wrong mandrel is chosen for the bend. A systematic, though empirical approach, to this problem may expedite matters. Here

is the way it is done:

Check clamp die for slippage. During the bending cycle even a slight amount of slippage can cause wrinkling.

Check pressure die setting. If there is not enough pressure on this die, flattening and wrinkling may result.

Inspect the mandrel setting. If you are using a plug-type (Fig. 6) mandrel and excessive flattening still occurs, try resetting its position. Start with the tip of the mandrel at the tangent point of the bend. Make successive settings, advancing about 1/16" at a time after each test bend.

Advancement beyond the tangent point takes up the I.D. clearance provided for easy loading and adds more

support to the tube wall. (Fig. 4). If the mandrel is advanced too far, the tube will break, (Fig. 5), or the machine will stall. If a good bend cannot be obtained before breakage occurs and other adjustments are in order, switch to a form type mandrel which is made to fit the curve of the bend. (Fig. 6). This may give just enough more internal support to eliminate the problem. Fine increment adjustments of the form mandrel may also be required.

#### Thin Walls And Tight Radii

For thin wall tubing and tight radii bends, neither type of the above mandrels will give the necessary support. In this case, use a flexible ball mandrel which will extend deeply into the bend. (Fig. 6). But, before making the first test bend, check the

setting of the ball mandrel thoroughly to see that the balls will swing easily around the bending form, conforming to the die radius. If not, the linkage may be broken on the first test.

#### Lubrication Is Important

Frequent slide lubrication is necessary for good performance, too. Slide wear makes it impossible to maintain proper adjustment of tooling. Slides should be thoroughly lubricated at least once for every eight hours of operation. Regular lubrication not only provides a wear-resistant film, but also serves to flush out small abrasive metal particles which accumulate in ordinary operation. If your machine is equipped with an automatic lubricator, make sure the reservoir is kept full.

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## WHAT DO YOU BEND? continued

drel is a major factor in successful bending. A lubricant should always be used when bending with a mandrel, particularly the flexible type mandrel. Lubrication will reduce mandrel galling, pickup and frictional drag between the moving tube and the stationary mandrel (Fig. 8). Clamp slippage, flattening of the bend, and tube breakage are reduced.

A lubricant also should be used when employing a wiper die. It reduces friction, wear on the die, and helps prevent scratches on the work. Whenever there is flat, sliding contact between the material being formed and a die or material guide, apply lubricant at this point.

Lubricants can be applied inside a

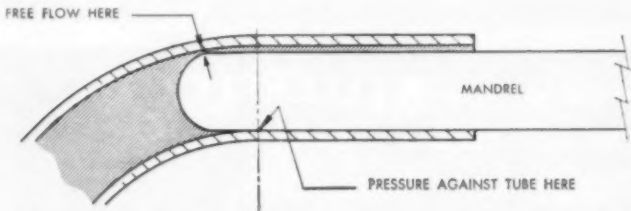
tube by dipping, swabbing, or spraying. This depends on the material length, diameter and other job conditions. In some cases where a relatively light, non-evaporating lubricant such as light oil can be used, a mandrel rod lubricator can be used. External lubricant can be applied to the workpiece or dies with a swab.

### Keep Clamps Clean

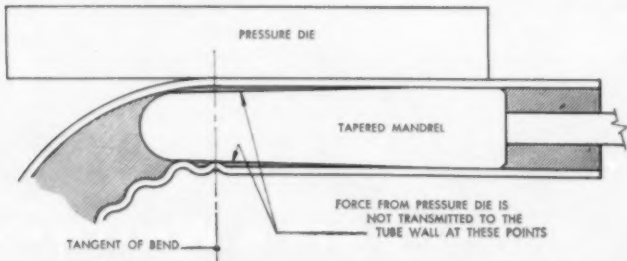
Never allow the lubricant to penetrate into the clamping areas. This error will cause slippage and resulting rejects.

### What Kind Of Lubricant?

The type of lubricant will vary with material and job. For aluminum, a



8—Dimensions of this drawing are exaggerated to show that clearance between mandrel and I.D. of tube must be sufficient to permit free metal flow over the mandrel. Lubricant is important at this point for successful, good quality bends and to protect tooling.



9—Here's an obvious error which can result in wrinkles if mandrel is tapered through poor machining or wear.



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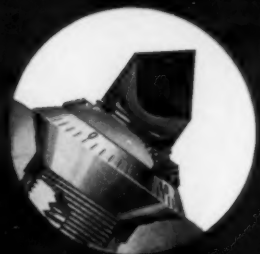
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# MANDREL SELECTION CHART

WALL THICKNESS															
Tube Dia.	.016	.020	.025	.028	.035	.042	.049	.056	.065	.072	.078	.083	.095	.109	.120
F indicates form mandrel								Figures indicate number of balls							
5/8"	1	1	1	1	1	F	F	F	F	—	—	—	—	—	—
3/4"	1	1	1	1	1	F	F	F	F	—	—	—	—	—	—
7/8"	1	1	1	1	1	F	F	F	F	—	—	—	—	—	—
1"	2	2	2	2	2	1	1	1	1	F	F	—	—	—	—
1 1/4"	3	3	2	2	2	2	2	2	2	2	1	1	F	F	F
1 1/2"	3	3	2	2	2	2	2	2	2	2	2	1	1	1	1
1 3/4"	4	4	3	3	3	3	3	3	3	2	2	2	2	2	2
2"	4	4	3	3	3	3	3	3	3	2	2	2	2	2	2
2 1/4"	4	4	4	4	4	3	3	3	3	2	2	2	2	2	2
2 1/2"	4	4	4	4	4	3	3	3	3	2	2	2	2	2	2
2 3/4"	4	4	4	4	4	3	3	3	3	2	2	2	2	2	2
3"	5	5	5	5	5	4	4	4	4	3	3	3	3	3	3
3 1/2"	5	5	5	5	5	4	4	4	4	3	3	3	3	3	3
4"	5	5	5	5	5	4	4	4	4	3	3	3	3	3	3
4 1/2"	6	6	6	6	6	5	5	5	5	4	4	4	4	4	4
5"	6	6	6	6	6	5	5	5	5	4	4	4	4	4	4
5 1/2"	6	6	6	6	6	5	5	5	5	4	4	4	4	4	4
6"	6	6	6	6	6	6	6	6	6	5	5	5	5	5	5

Use this chart to select the proper mandrel to make good quality bends of 2-diameter radii up to 90°. As a general rule, for 1 1/2-diameter bends up to 90° or 2-diameter bends up to 180°, jump from form mandrel to one ball, or add one ball to number given in chart. For the white area in the bottom left corner, add two balls. But, for the white area in the upper right, no additional balls are necessary. **CABLE MANDREL**—use twice the number of balls indicated by this chart because cable mandrel balls are nested closer together.

heavy compound or a heavy oil is frequently used. But, with steel, a drawing compound or a lighter grade of oil is desirable. All the standard machine shop lubricants may be candidates for the job, in addition to soap and wax. In any case, the point to remember is that with sliding contact, the proper lubricant can make the difference between a successful bend and no bend at all.

An automatic lubricator system is a great advantage in operating with light oils or other light viscosity non-evaporating type lubricants. But, it is not good for soaps, water solubles, or lubricants which can evaporate and build up or clog the system.

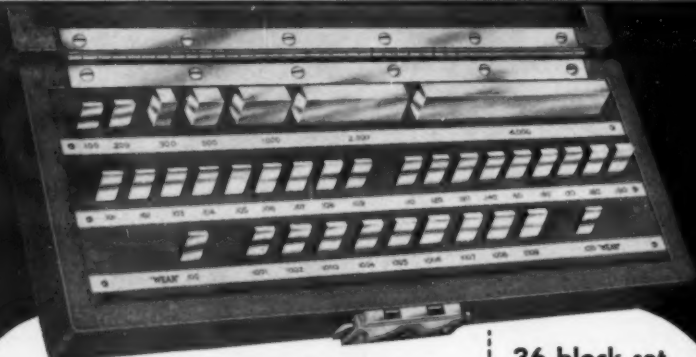
Even with proper tooling, good ad-

justments, adequate lubrication and any other desirable factors, there are still problems which occur in cases of material too hard for a required bend. If tubing is too hard, the most likely evidence will be breakage in spite of everything else established according to Hoyle.

## Too Hard To Bend?

A good indication of an approach to tubing too hard for a given bend is that first, wrinkles will be unavoidable. And, as pressure die pressure is increased to eliminate the wrinkles, there is a point at which the operator makes successive adjustments until he is quite certain that on the next bend the wrinkles will be gone. On that bend, the tube will fracture. You very

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## WHAT DO YOU BEND? continued

possibly have material that is too hard.

### Spot Annealing Sometimes Helps

If the material is too hard, it may be entirely impossible to make the bend without changing the properties of the material. One solution would be to spot anneal a section of the material and test bend that. If the bend can be made after annealing but not before, you have a possible answer on the question of excessive hardness.

While spot annealing tends to prove the case, it will not necessarily solve the bending problem. It introduces new problems in the form of scaling on the inside of the tube. Such scaling may or may not permit movement of the workpiece over the mandrel.

A generous application of lubricant on the mandrel will help if the tolerance between mandrel and workpiece allows for the film thickness. (Fig. 8).

If the part cannot be bent then, the next step is to consider using the next milder grade for the sharpness of bend being attempted. Before ordering new material it's a good idea to consult the bending machine manufacturer for his experience in similar cases.

### Selecting The Correct Tooling

The discussion of all problems in this article is based on the premise that you are working with the right machine and proper tooling. Tooling to suit your requirements can be obtained from the machine manufacturer in many cases cheaper than you can make your own—if you allow for troublesome problems and the time it will take to gain their experience. Purchased tooling comes tested and

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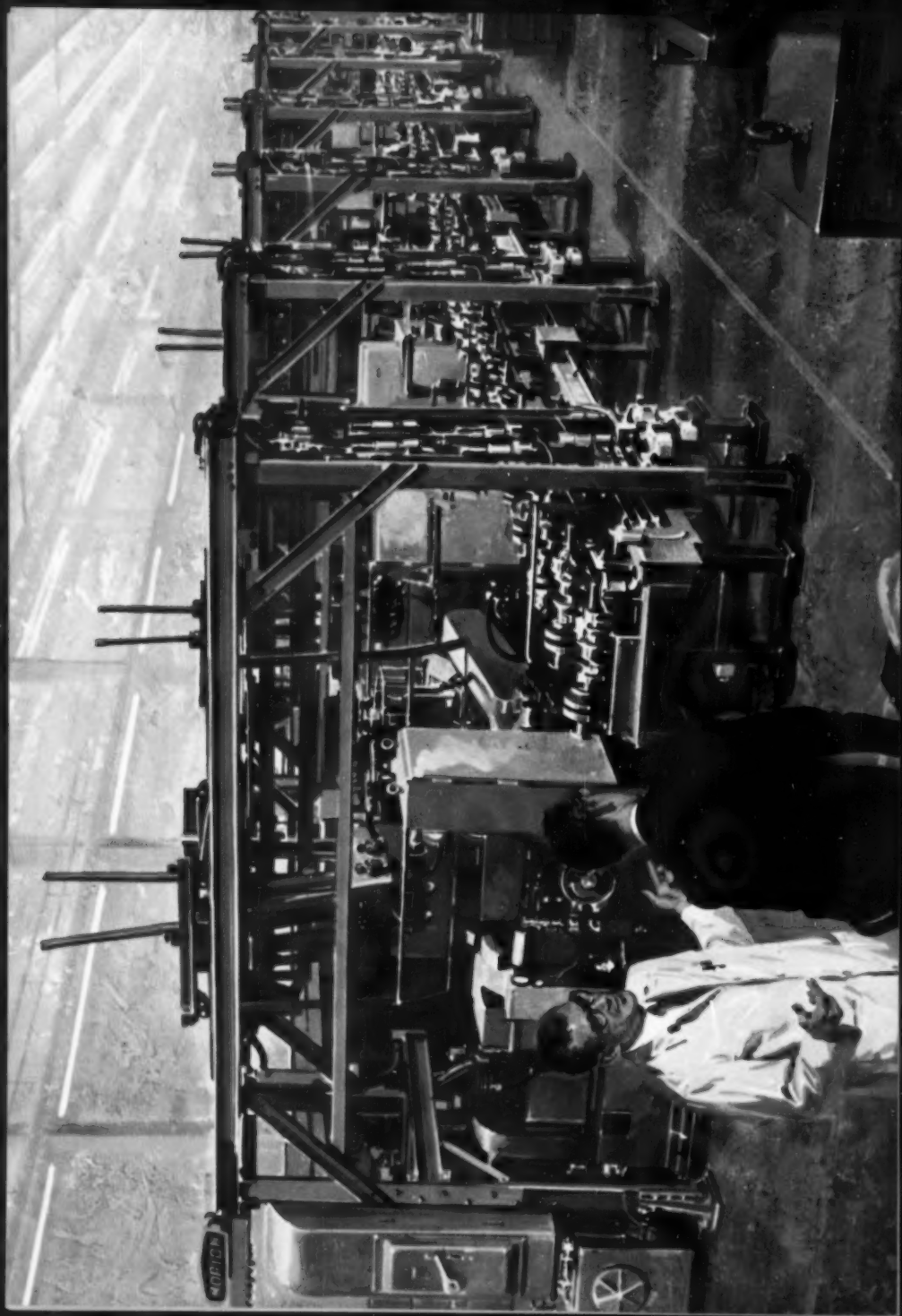
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ready for operation. But, the machine builder or tool supplier cannot serve you efficiently without adequate information about what you plan to do and how you are going about it.

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1. Specific material to be bent.
2. Round tube diameter or cross section dimensions of other than tubular workpieces.
3. Wall thickness if uniform, or all thicknesses of each section in extruded parts.
4. Bend radius to the centerline of round tubing, or bend radius to face lines of other shapes.
5. Maximum included angle of the bend from tangent to tangent.
6. Tangent distance between bends if more than one bend is to be made in the workpiece.
7. Name and serial number of your bending machine.

This is the least information you should supply before you can expect prompt cooperation and satisfaction. In addition to the above items, however, you should also, naturally, send a print of the job, giving all specifications. If not, next best will be a sample bent part. It is also a good idea to include the name of the part or product and the production desired.

What can you bend on a bender? The approach may not be direct and it may take a little time to achieve success, but the answer is: anything which can be made to flow under stress if you have the right machine and tools. . . .

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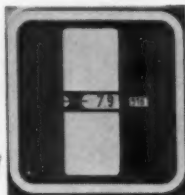
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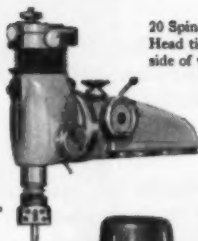


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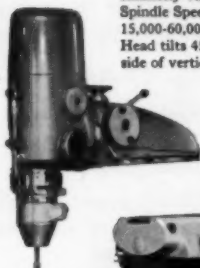
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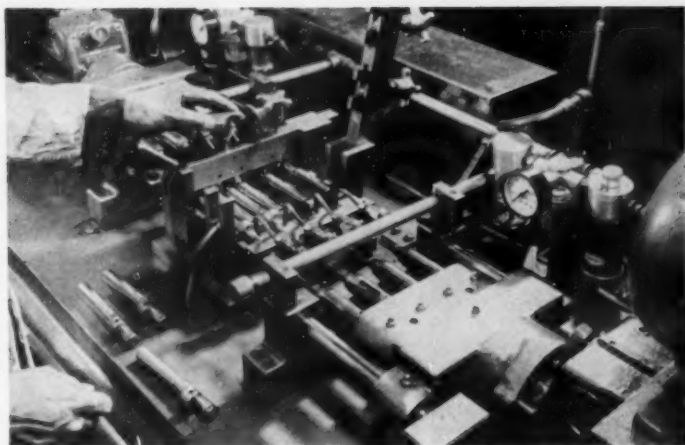
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## field reports

11



Simplicity is noteworthy in this fixturing of crankshafts for drilling  $\frac{1}{8}$ " diameter oil holes. Operator unloads and loads while other power unit drills fixtured parts. Holes are peck drilled in three passes.

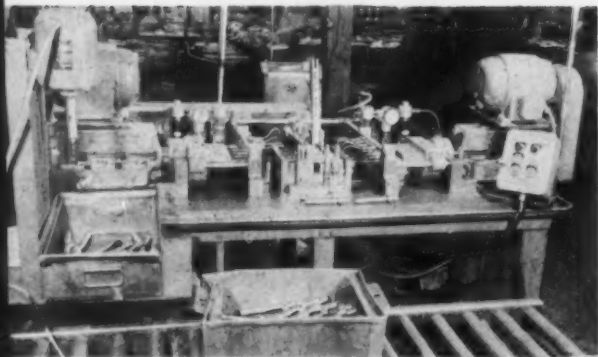
### IMPROVED FIXTURING PLUS POWER UNITS EASE STRAIN ON MACHINES AND OPERATOR

■A routine "improvement" check into production methods at the plant of a manufacturer of compressors and compressor parts revealed that their method of deep-hole drilling a compressor crankshaft casting was straining both men and machines.

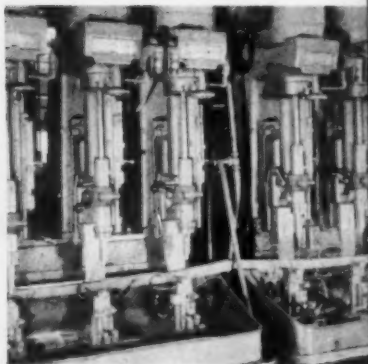
The operation consisted of drilling a  $\frac{1}{8}$ " diameter hole, 2-10/32" deep in one end of a pearlitic iron crankshaft. The part was being drilled on one of two four-spindle vertical drill presses. Each spindle had a separate hand loaded fixture; each operator had to traverse the length of his table, loading and unloading fixtures in sequence.

Although this method was adequate when first adopted, rising production demands soon made it apparent that quality standards and production schedules could not both be maintained.

An alternate method was developed in cooperation with the Drillmation Company of Center Line, Michigan. The resultant



AFTER: One machine using one fixture enables one operator to stay put. Note saving in floor space and handy location of conveyor system.



BEFORE: Eight of these vertical drill presses, each equipped with a separate hand loaded fixture, kept two men busy serving each spindle on the line.

### *When men and machines strain, quality suffers*

#### **FIXTURING PLUS POWER UNITS** continued

machine is called "Double-End Deep-Hole Drilling Machine." Nucleus of the machine is two Model 500 power units, each equipped with a four-spindle, flange-mounted drill head equipped with a deep hole attachment.

Fixturing is compact. A hand loaded fixture holds eight workpieces; the operator unloads and loads four workpieces at one end while the power unit at the other end is cycling.

Savings were apparent from the very first as one operator now has the same production capacity two operators previously had. The power units are also run at much slower speeds than the drill presses were run. Where the drill presses ran at 110 sfpm, at

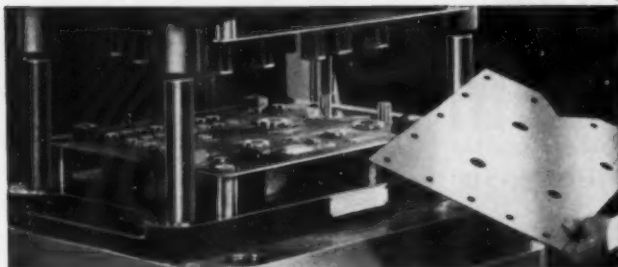
3600 rpm and at 5.4" per minute feed, the power units performed the same operations at 45 sfpm, at 1600 rpm and 4.55" per minute feed (.0028 ipr).

The slower speeds eliminate the former failure of bearings and of pump failures. Tool life is extended two or three times, according to plant personnel.

An added inducement towards special machines of this nature—the company realizes a 50 per cent saving in floor space and also a reduction in material handling. A gravity conveyor now carries all parts to and from the machine.

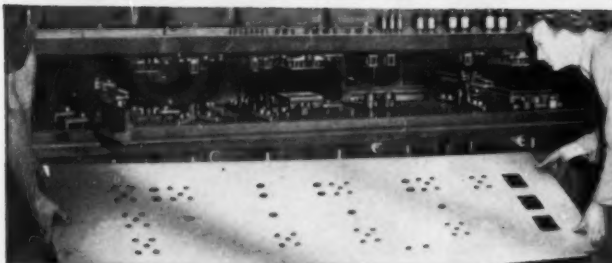
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## NEW TOOLS AND TECHNIQUES KEEP UNITED'S JETS FLYING

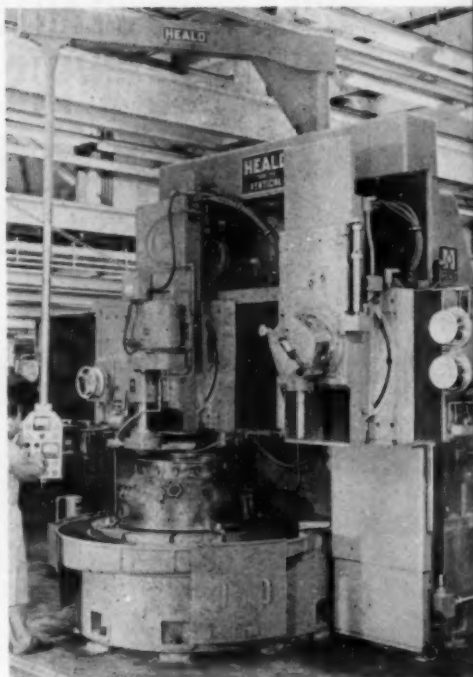
SOUTH SAN FRANCISCO—United Air Lines is revolutionizing jet engine overhaul at its new maintenance base here. The job is being done with a new type of vertical machine capable of a variety of grinding, boring, facing, turning and associated operations.

Big enough to handle such large parts as turbine engine diffuser cases, the Heald 578 vertical can accommodate work up to 52 inches in diameter and 48 inches high. It is versatile enough for such jobs as: grinding tips of rotor blades; turning IDs and shoulders of aluminum rings in stator blades; turning and grinding stainless steel diffuser case joints; grinding bearing seats on shafts and in rotor shaft bores; toolroom jobs such as grinding the planimeter rings for checking the shape of sheet metal sound suppressors, the holding fixtures used on the machine, and the tips of bushings in a ring jig for locating 80 ventilation holes inside the diffuser casting.

### Jet Age Maintenance

For United, the 578 represents an answer to problems inherent in jet "remanufacture," which differ sharply from overhaul practices encountered in piston engines.

Size of the components alone calls for flexible equipment capable of handling a variety of operations with minimum set-ups. Commercial overhaul plants can't base their operations methods on military experience or on



New Heald vertical machine installed at United Air Lines' jet engine overhaul base is capable of a variety of grinding, boring, facing, turning and associated operations.

original engine manufacture because conditions just aren't the same. Jet parts require a big machine (the 578 is 15 feet high, 15 feet wide and 12 feet deep) with great swing and travel, rigidity to handle big components but with a light touch for smaller aircraft parts. Flexibility for machining several types of metal on the same equipment demands greater versatility in speeds, feeds and controls.

### Machining Sequence

When the Pratt & Whitney engines which power the United's DC-8 Jet Mainliners enter the turbine overhaul



and test section they are stripped to individual components for preliminary cleaning. After inspection, the stainless steel cases move to the Heald vertical for boring and turning operations.

Chrome plating levels the worn and pitted areas, after which finish grinding (at up to 6000 surface feet per minute) restores the part to dimension within a required tolerance of 0.0003" and 15 RMS finish.

Diffuser cases are held with four chuck jaws on the table. Rotor and stator rings are clamped on the table with hold-down clamps between sheets of 1/4" thick rubber centered on a steel stud to prevent distortion during grinding. Carbide tools are held in the turret by ram type holders, and when coolant is used, it circulates at 20 gallons per minute at 30 psi.

#### "Universal" Machine

The ten-ton slide assembly of the 25-ton vertical incorporates both a grinding head and a metal cutting turret. The five-position turret cut-



Grinding big stainless steel turbine diffuser case. The vertical machine is remotely controlled from a pendant while the machine is operating.

June, 1960

# PRODUCTION MEN

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## FIELD REPORTS continued

ting compound, used primarily for roughing, holds five single-point tools for boring, facing, turning and associated operations. The grinding head is used for finishing operations and is capable of internal, face, external and rotary surface grinding.

### Unique Control System Used

The machine's control system is unique in that speeds are controlled hydraulically from a remote position by electrically actuated throttles. Electro-hydraulic reversal of the grinding slide is effected without mechanical linkages by transistorized proximity limit controls developed by the tool builder. This system avoids the necessity for a mechanical linkage from the dogs to reverse valves high up on the slide, which would have

made the slide assembly large and cumbersome. Direct current actuated valves of Heald design are utilized for compact size and speedy operation.

The transistorized control also serves to soften reversal strokes electrically to prevent inducing shocks into the machine structure which would affect finish. A remote control dwell at either end of the grinding stroke allows bringing slowly rotating large diameter work to size without secondary grinding. Tarry or dwell of 1/3 to 20 seconds at top and bottom can also be set independently.

A barrel stop on the cutting slide is geared to the turret for a feed depth control. When the turret indexes, the barrel also indexes so each tool in the compound stops at the same hole depth regardless of tool length.

• • •



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when I'm getting by OK?***



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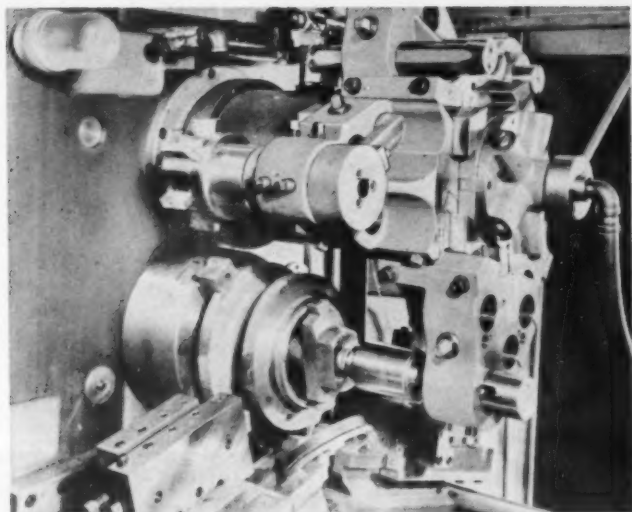
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MACHINE and TOOL BLUE BOOK



Seat ring driver used on Warner & Swasey 2-AC chucking automatic to handle an assembly operation during automatic machining of regulator valves at Minneapolis-Honeywell Regulator Co.'s valve division, Fort Washington, Pa.

### **COMBINED OPERATIONS INCREASE VALVE PRODUCTION AND QUALITY**

■ Combining of an assembly operation with an automatic machining cycle is the technique used by Minneapolis-Honeywell Regulator Co. to increase production and quality of precision regulating valves for heating and air conditioning equipment applications. The units are produced at the company's Valve Division, Fort Washington, Pennsylvania.

A Warner & Swasey 2-AC single spindle chucking automatic, equipped with a three-jaw air chuck, handles all required machining on each cast iron valve tailpiece, using only three of the machine's five available turret stations. This work includes tapping of a  $6\frac{5}{8}$ "-10 pitch thread.

A cycle stop pin inserted in the 2-AC index control

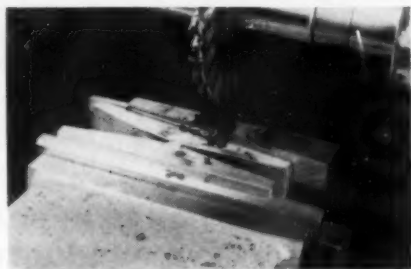
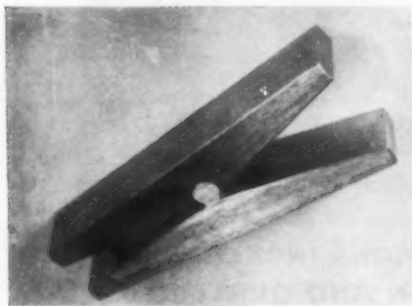
drum stops the automatic cycle between turret station No. 3 and No. 4 to permit a 6" dia. bronze seat ring to be started by hand. Pressing the cycle start button then returns the machine to automatic operation, with station No. 4 automatically driving the seat ring home, and station No. 5 finish boring to a .003 total tolerance and forming the 60° valve seat in the bronze insert.

The seat ring driver (see photo) consists of a standard friction tap chuck with a special spring loaded drive plate. As the turret feeds toward the chuck, two ears on the drive plate engage driving lugs on the seat

ring. The spring action of the drive plate permits slight longitudinal movement and eliminates possible damage to the turret drive mechanism as it feeds forward to its positive stop. Feed rate is equal to the 10-pitch thread on the seat ring or .100" per revolution. Spindle speed for this driving operation is 292 rpm.

Machining the work piece, inserting the seat ring, and finish machining the ring—all in one chucking—not only speeds production, but assures precision concentricities, according to Minneapolis-Honeywell engineers.

• • •



## PIVOTING PARALLEL HOLDS TAPER WORK IN VISE

By H. J. Gerber

■ Flat, tapered work can be held securely in vises of milling machines, drill presses, etc. by use of this two piece pivoting parallel which adjusts itself to small angles up to about 20°.

The parallel is made in two parts keyed together with an integral round key. This one is made by bandsawing the male keyed part and finishing the contour of the key on a die maker's

filing machine. The key seat in the female half was drilled before the contour was sawed. Another method for producing the key on the male half would be to braze a dowel pin to the contour sawed piece.

This simple shop-made accessory has paid for itself many times over on the "tough to hold" jobs like the one illustrated.

• • •



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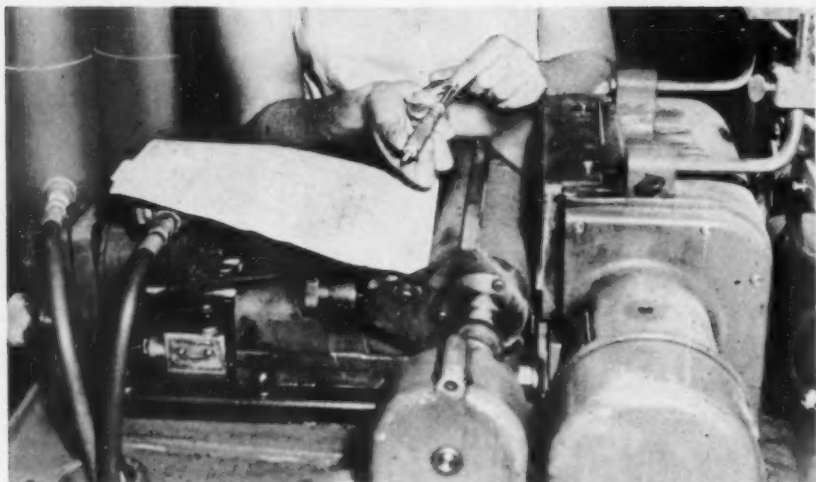
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WITH A SETUP LIKE THIS crush form grinder, small cylindrical parts can be formed from laminated plastic or vulcanized fibre stock to finish tolerances as close as  $\pm .0005''$  or tighter. Equipment is a specialized form of centerless grinder which can form any part produced on a lathe.

## CRUSH GRINDING OFTEN BEST METHOD TO FORM SMALL CYLINDRICAL PARTS

■ When forming small cylindrical parts from laminated plastic or vulcanized fibre, particularly in large quantities or to extremely tight tolerances, Taylor Fibre Co., Norristown, Pa., suggests that crush form grinding be considered.

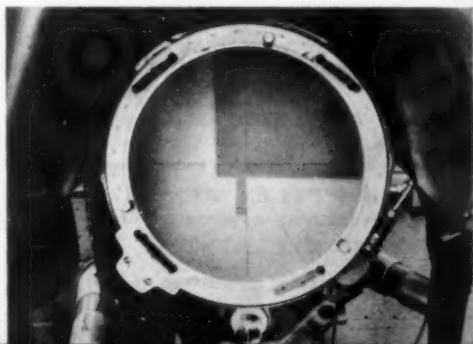
This adaptation of conventional centerless grinding not only does the job as much as 20 per cent faster than screw machine or lathe production but also, in many instances, makes the difference between meeting or not meeting tolerance requirements. Leaving no burrs, it thus eliminates a separate operation.

Capable of producing any part which can be produced on a lathe with forming tools, crush grinding is

recommended where:

- Finish tolerances must be held to  $\pm .0005$  inch or tighter (normal screw machine or lathe tolerance is  $\pm .002$  inch).
- The parts are required in large

YOU GET PARTS LIKE THIS. Shown in the profilometer used to check tolerances of .0005" is a firing pin, which could not have been produced to tolerance requirements by other methods. Pin is .225" long, .064" in width, and has a 15° taper to .020" depth at ends.



enough quantities—generally 300,000 and upwards—to justify initial cost of wheels.

- Lathe bits might cause de-lamination of the laminated plastic.

A multiple series of grooves, bevels, or other configurations are cut into the work wheel surface for the specific part being formed. As many as 25 or 30 small parts can be made at a time from a single piece of feed stock, at rates of up to five or six cycles per minute. Wheels are capable of long runs with little wear, depending upon the material being worked.

The work wheel and the backup wheel both support the work, minimizing the breakage which is sometimes suffered with lathes or screw machines, particularly when forming long, thin pieces.

A recent case illustrates the value of the technique. In this instance, the part required was a firing pin, only .225 inch in length, .064 inch in width, and with tolerance of  $\pm .0005$  inch, with no burrs permitted. Requiring a 15 degree taper at either end, to .020 inch depth, this simply could not have been made by other production methods and still have met required tolerances.

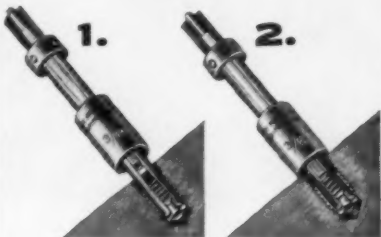
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... OR LIKE THESE. These laminated plastic parts are among those which Taylor has produced by the crush form grinding technique. Parts shown are small reels, bobbins, rivets, shafts and pins for a wide number of applications. Parts up to 8" in length and to 1 1/2" in diameter can be formed by this method.



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2. The extractor is pushed down until it touches the broken tap, and the sleeve placed firmly in contact with the work.



3. With a tap wrench (not shown) applied to the square end of the extractor, the broken tap is simply and easily backed out.

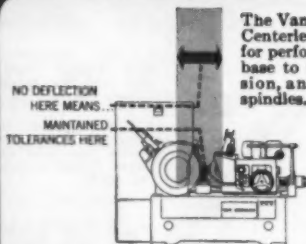
No annealing or drilling. The broken tap is removed without delay . . . and without damaging the threads. Furnished for 2, 3, 4, 5, 6 flute styles, in sizes No. 4 to 1 1/2". Try them at our expense (free trial) in your shop.

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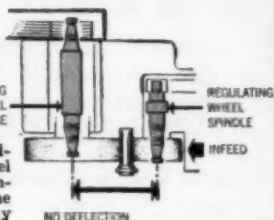
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### VN Centerless Grinding cuts production operations,

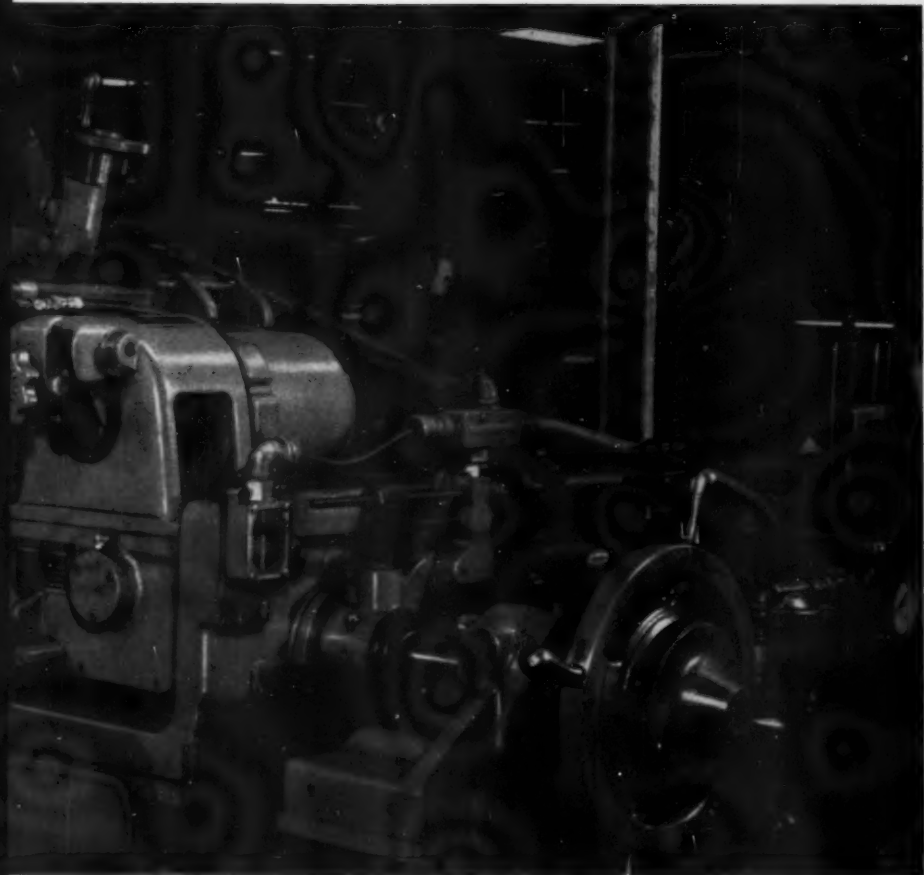
Bendix boosted hourly production of Autosyn syncro shafts to 600 per operator with a Van Norman Centerless Grinder. One Van Norman Centerless Grinder (with a specially developed automatic feed) replaced two manually fed machines, which produced only 50 shafts per hour.

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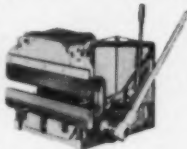
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## BRAKES



11 Hand Operated Models

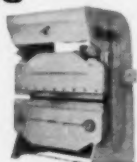
## PRESS BRAKES



1 Hand Operated  
Model



3-12 Ton  
Models

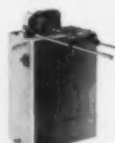


2-25 Ton  
Models

## ROD PARTERS



2 Hand Operated  
Models



1 Power  
Model

## BENDERS



5 Hand Operated  
Models



2 Power  
Models

## ROLLERS



8 Hand Operated  
Models



6 Power  
Models

## SHEARS and NOTCHERS



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Operated  
Shears

1 Hand  
Operated  
Notcher



4 Power  
Shears



1 Power  
Notcher

## SPRING WINDER



1 Hand Operated  
Model

## PUNCH PRESSES



2 Hand  
Operated  
Models



2 Power  
Models



1 Turret  
Model

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# free literature

To receive copies of booklets described below, circle their identifying numbers on an Action Card, found opposite pages 96 and 224.

# 13



(See Number 1)



(See Number 2)



(See Number 3)

**1. Precision Measurement.** Micro-Line is a new photographic imaging technique in the field of super fine precision measurement. It is stated the process has made possible photo reductions of a million or more diameters without distortion. Scale has 1,000 lines to the inch with an accuracy reported to .0001". The vernier situated in the eyepiece of the microscope gives direct reading to one ten-thousandths of an inch. Literature is issued by Micro-Line Inc., Jamestown, N.Y.

**2. "Pressure Forming Internal Threads With Tru-Lede Fluteless Taps"** is the title of a brochure on this tap, which is actually a forming tool, whose action may be compared with external thread rolling. The technique involves displacement of metal without removing it. Standard sizes and net prices, recommended drill sizes for the taps, tap and product pitch diameter limits, etc. are included. Greenfield Tap & Die, Greenfield, Mass.

**3. Milling, Drilling and Boring Machine.** 16-page bulletin No. AP-60 entitled "Around A Part in Just 8 Days" describes in pictures the actual story of how a typical Milwaukee-Matic job was processed from print to finish-machined part in only eight working days. It compares conventional manufacturing methods with the Milwaukee-Matic system. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

**4. Self-Leveling Work Positioners.** Photographs show clearly how the top layer of material on the Lowerator work positioner is kept always at the ideal working/dispensing level, whether the unit is completely filled, half-full or nearly empty. Recommended uses, dimensions, and weight capacities are included for all types and models. Lowerator Division, American Machine & Foundry Co., AMF Bldg., 261 Madison Ave., New York 16, N.Y.

**5. Cross-Slide Rotary Table.** Bulletin gives complete details and description showing the many uses, the design, construction features, etc., and the variety of actual jobs which can be made by using this unit. Once the work is located and clamped on the top cross-slide, it is rarely necessary to move or reclamp until all cuts are completed. Advance Prod. Corp., N. Shore Dr., Benton Harbor, Mich.

**6. Turret Drilling Machine.** The bench model Burgmaster machine has its own built-in power-indexing mechanism with safety clutch. Folder also states that operator can center drill, drill and tap in orderly sequence. Each spindle operates at its own speed for machining with all tool diameters up to 1/4", 350 to 6200 rpm, 12 speeds (2 for each spindle). Burgmaster Corp., Box 311, Gardena, Calif.

## FREE LITERATURE continued

**7. Milling Machines.** Illustrations, descriptive material and technical data are provided in brochure on the Bohle knee type, cycle, bed type, copying and production milling machines, as well as special machine tools. Reinhard Bohle Machine Tools Inc., 2190 E. 40th Ave., Denver 5.

**8. Stamp Holders.** Hercules gang stamp holders, with quick release, permit instant interchanging of letters and figures. Sizes range from four piece holders to ten piece holders. Price list is included with literature available from the Acromark Co., 15 Morrell St., Elizabeth 4, N.J.

**9. Cutting Fluid.** 27-page catalog includes six types of Trim offered for the particular job, with ten steps to better machine production, and a selection chart. Product is water-based, but uses chemical for lubricating properties (rather than oil—inflamable). Master Chemical Corp., 13 N. Huron St., Toledo 1.

**10. Air Stakers.** Brochure illustrates various models to meet numerous production requirements with a wide selection of interchangeable tooling. Basically an arbor press with a staking feature, it performs pressing or staking operations independently or combines them in rapid sequence. Assembles small components such as cams, bushings, gears, etc. Cramer Controls Corp., Centerbrook, Conn.

**11. Power Saws.** A 12-page color catalog describes and illustrates a new line of power saws. Included are Models C-67

and C-68 for straight cut-off work and Models C-167A and C-168A for mitring and angular, as well as straight, cut-off work. Featured is the Speedmaster variable drive which makes it possible to change tool speed instantly within range 60 to 350 fpm. DoAll Co., Des Plaines, Ill.

**12. Jig Boring Machine.** The Atlantic Model 5000 jig borer locates holes with accuracy of one ten-thousandths of an inch and bores holes within limits of .0002". Infinitely variable dial controlled, the machine has low range, 45 to 275 rpm, and high, 275 to 1980 rpm. Further details and specifications are covered in bulletin from Atlantic Machine Tool Works, Inc., 549 Cedar St., Newington, Conn.

**13. Automatic Bar Feed** automates the feeding of bar stock for practically any lathe. The E-Z-Air holds and feeds bar stock diameters of 1" and smaller. Three tube sizes are offered to accommodate 3', 4' and 6' stock. Holdridge Mfg. Co., 5828 Santa Fe Ave., Los Angeles 58, Calif.

**14. Cut-Off Machines.** The Model MF and Model MH-A automatic metal cut-off machines are described, with specifications, in flyer offered by Comet Mfg. Co., 2033 Santa Fe Ave., Los Angeles 21, Calif.

**15. Name Plate Stamping Machine.** The Acromark stamps nameplates, parts, tags, tickets, etc. Literature discusses special types for special jobs, special fixtures, and various models. The Acromark Co., 15 Morrell St., Elizabeth 4, N.J.

**16. Bar and Angle Shear,** in 50 tons capacity, is illustrated and described in flyer available from The Shearease Co., P.O. Box 125, Torrance, Calif.



(See Number 9)



(See Number 10)



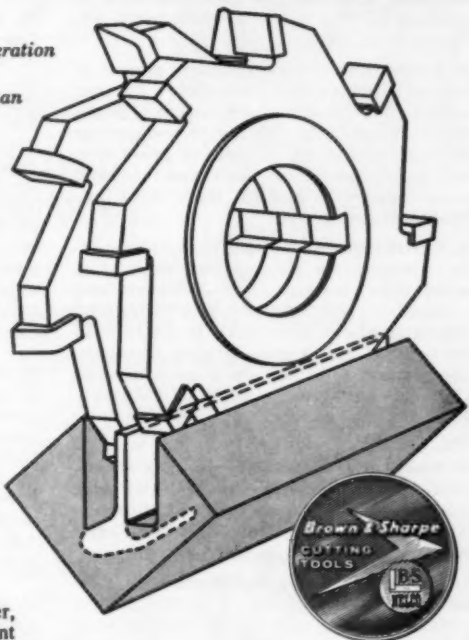
(See Number 11)

# Changing to NELCO Carbide Tipped Cutters gives Hinge Manufacturer Tremendous Competitive Advantage!

*Drawing shows one milling operation that eliminated 5 others and completed cuts 6 times faster than cutters previously used.*



*Brown & Sharpe Cutting Tool Engineer demonstrates faster milling speeds and improved surface finish on aircraft hinge using Nelco Cutters in gang.*



A Brown & Sharpe Cutting Tool Engineer, with the approval of management in a plant making aircraft hinges, assisted in effecting substantial production savings and improved quality on dozens of production milling projects.

Nelco Carbide Tipped Cutters now mill a 72" bronze hinge piece, in one pass, at 12 to 15 inches per minute feed and produce a superior finish. Formerly, a feed of 1 inch per minute was maximum. Time for another milling operation was reduced from one hour to 2½ minutes.

Tremendous production benefits can result from B&S Tooling Service.

A B&S Cutting Tool Engineer in your shop can show you how...and he will, if requested, hold a training course for machine operators in your shop.

There's no obligation. It's all part of the new B&S COMPLETE TOOLING SERVICE. Call your local B&S Distributor today.

## NELCO

**NELCO Tool Co., Inc.**

Subsidiary of:  
Cutting Tool Division  
Brown & Sharpe Mfg. Co.,  
Providence 1, Rhode Island

Send for the  
B&S-NELCO  
"Condensalog"



## FREE LITERATURE continued

**17. Molten Metal Pumps.** The Gusher vertical centrifugal type pumps are specifically designed for handling molten salts, lead, babbitt, solders and other alloys at temperatures up to 1000°F. Models, with adequate specifications, are provided in folder from The Ruthman Machinery Co., Cincinnati 2, Ohio.

**18. Gages.** Eleven new products appear in 56-page illustrated, pictorially indexed catalog of mechanical dimensional gages. These include pitch diameter comparator for fast checking of threads or gears, dial snap gage models, and limit type form and groove gages. Standard Gage Co. Inc., Poughkeepsie, N.Y.

**19. Cut-Machining Catalog** includes modular, combination cutting and deburring, swing type, Rotator, Roll-A-Round, and a complete line of band saw machines. The value of cut machining, in which both cut ends of metal rods, angles, channels, I-beams and solid bar stock are cut clean with circular abrasive saws, is described. Wallace Supplies Mfg. Co., 1304 W. Diversey, Chicago 14, Ill.

**20. Power Air Tools.** The company's complete line of grinders, sanders, and wire brushing tools is described and illustrated in Catalog G-60. Master Power Corp., Box 269, Krick Rd., Bedford, O.

**21. Preformed Tumbling Media** are presented in folder for use in barrel and vibratory finishing operations. Seven shapes are available, in various types for specific metals. Fortune Industries, Inc., 11770 Dexter Rd., Chelsea, Mich.

**22. Resistance Welder Manufacturer's Assn.** has issued a leaflet telling the story of its service to industry and to its members. It illustrates the many educational aids available to the welding industry and includes the Assn.'s publications. RWMA headquarters, 19000 Arch St., Phila. 3.

**23. Fatigue Testing Machines.** The Riehle-Los machines are said to have unrestricted capacity, ranging from 12,000 to 300,000 lb., and can handle deformations on loading strokes up to 6" as standard, and more if needed. The machines accommodate a wide range of load, stroke and frequency demands. Bulletin is offered by Riehle Testing Machines, E. Moline, Ill.

**24. Power Presses.** Folder SD2-60 details straight sided double crank mechanical power presses. A chart lists standard and extra features available on the presses. Cleveland Punch & Shear Works Co., Cleveland 14.

**25. "Localized Color Filling & Application"** is title of printed article which discusses a mechanical means of applying filling to embossed, die cast, engraved and other sunken designs, lettering and decorations, eliminating old hand filling problems. Printing machines for printing manufactured products are also described. The Acromark Co. 15 Morrell St., Elizabeth 4, N.J.

**26. Cap Screw Bulletin** gives complete specifications, dimensions and data on the new 1960 Cap Screw series, and compares the new series with the old. Set Screw & Mfg. Co., Bartlett, Ill.



(See Number 18)



See Number 19)



(See Number 20)

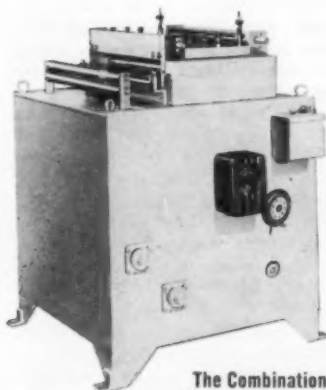
# What's NEW in Press Room Equipment?

See these **benchmasters** for  
**IMPROVED FEEDING METHODS,  
BETTER LOW-COST PRODUCTION!**



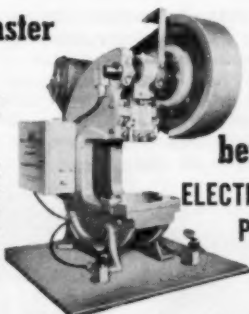
## benchmaster MAF MACHINE

Motorized Automatic Feeding (MAF) Machines supply uniform measured lengths of flat strip or coil stock to any secondary machine. They cycle either manually or by linking to a machine for automatic feed. Stock is pulled from a reel, or preferably, from a KOIL-KRADLE slack loop. Feed length is adjustable from 3" to 60". Stock widths up to 12" wide. Other capacities on special order.



## benchmaster FS MACHINE

The Combination Length Feeding and Straightening (FS) Machine automatically straightens flat strip or coiled stock and supplies measured lengths to a secondary machine. It also pulls from a reel or KOIL-KRADLE slack loop. By first removing curl, camber, kinks, etc., stock feeds faster with greater accuracy, improves production and quality of parts.



## IMPROVED benchmaster ELECTRO-MAGNETIC PUNCH PRESS CLUTCH

A safe, manual or automatic punch press clutch that eliminates sliding keys, breakage hazards and time lag...pickup occurs at any part of flywheel rotation. Dual purpose cam switch prevents double tripping. Single trips or operates continuously, other electrical control settings for manual set-ups, foot control, 2 button hand control or automatic operation. Also available: Air Clutch and Mechanical Clutch equipped punch presses.

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manufacturer of small punch  
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**FREE LITERATURE** continued

**27. Carbide Cutting Tools.** 24-page Catalog No. 114 covers Dixie Tool's complete line of standard carbide cutting tools and special engineering services. Complete specifications are given on end mills; die sinking, routing and keyway cutters; drills, burrs and file sets. Introduced is a new tool—a solid carbide bore reamer that bores and reams all in one operation. Dixie Tool Industries, 4555 W. Franklin Ave., Bridgeport, Mich.

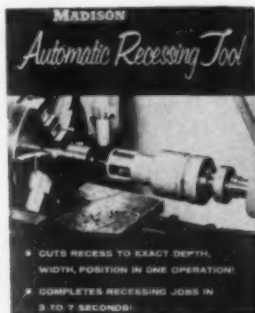
**28. Diamond Grinding Wheels.** Form ESA-310 describes Simonds Abrasive Co.'s diamond grinding wheels, featuring both man-made and natural diamonds. Grain and grade recommendations, operating data and illustrations of all standard shapes are included. Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.

**29. Hardness Conversion Chart** shows approximate relation between hardness by various testing systems and tensile strength of carbon and alloy steels. The hardness systems covered are Brinell, Monotron, Vickers, and Rockwell (B, C & E scales) and Scleroscope. Babcock & Wilcox Co., Tubular Products Div., Beaver Falls, Pa.

**30. Hydraulic Milling Machine.** Photographs, diagrams and floor plan drawings point out the value of the Kent-Owens No. 3-36 miller. It has automatic hydraulic table feed, table working surface of 64"x16" with 36" table travel, and fully automatic cycle. Kent-Owens Machine Co., 958 Wall St., Toledo 10, Ohio.



(See Number 30)



(See Number 31)



(See Number 32)

**31. Automatic Recessing Tool**, as described in recent brochure, cuts recesses to exact depth, width, and position in one operation. It will complete a recessing job in 3 to 7 seconds. Madison Industries, Inc., P.O. Box 1137, Providence, R.I.

**32. Annular Form Grinder.** A machine for grinding annular forms and grooves in workpieces up to 10" in diameter and 24" between centers is presented in Sheffield's Catalog No. FG-181-260 on the Model 181 Multifform grinding machine. It uses the Crushtree® grinding wheel dressing process to grind multiple diameters or forms up to 4" wide in one operation with single or multiple wheels. The Sheffield Corp., Dayton 1, Ohio.

**33. Product Printing Machines**, in eight types, are used for printing plastic products and for filling or applying color to sunken design, lettering or decoration. Flyer from The Acromark Co., 15 Morrell St., Elizabeth 4, N.J.

**34. "Coatings For Vacuum Metallizing"** presents the application and use of vacuum metallizing coatings which may be applied by spraying, dipping, and flow coating to thermoplastics, thermosetting plastics, metals and glass. Bee Chemical Co., Logo Div., 12933 S. Stony Island Ave., Chicago 33, Ill.

**35. Wire Cloth Fluid Filter Elements.** Brochure No. 142 covers typical fluids and systems which can use Bendix Poromesh and Micromesh wire cloth filters. Bendix Filter Div., 434 W. 12 Mile Rd., Madison Heights, Mich.

**36. Abrasive Compound.** Carborundum's new folder on Carbo-Latex P5 describes a new synthetic latex abrasive compound



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## LAPMASTER OPTICAL FLATS

So accurate . . . so easy to get flatness readings down to  $1/10$  of a light band with the Lapmaster line of Optical Flats. Special manufacturing technique and laboratory control assures uniform flats of highest quality.

Available in certified optical accuracies of .000002" or .000001" . . . in either clear fused quartz or Pyrex glass . . . either double or single surfaced . . . in a full range of standard sizes from 1" through 12" dia.



## THE LAPMASTER MONOCHROMATIC LIGHT

There's no easier way to inspect and measure surface flatness. The new Lapmaster Monochromatic Light has a powerful helium lamp (40 candle power) for sharp reading . . . light head is adjustable for best reading angle; can be swung completely around to handle tall parts . . . is easily portable in self-contained carrying case.



Write for complete details and measurement chart.



**CRANE PACKING COMPANY**  
6412 OAKTON STREET  
MORTON GROVE, ILLINOIS (Chicago Suburb)  
In Canada:  
Crane Packing Co., Ltd., Hamilton, Ont.

## FREE LITERATURE continued

for safety on anti-skid floors, stair treads, sidewalks, highways, and airstrips. The Carborundum Co., P.O. Box 337, Niagara Falls, N.Y.

**37. Internal Spline Gage.** Comtorplug expanding plug gage is equipped for "between-pins" gaging of internal splines and gears as quickly and easily as gaging plain round holes. Bulletin No. 50 is offered by Comtor Co., Waltham 54, Mass.

**38. Precision Surface Grinders.** Bulletin No. 560-1 describes the Covet "Compact" line of grinders from 6"x12" to 10"x16" capacity in both hand and power feed models. Included also is the entirely new No. 6A cutter and tool grinder featuring a swiveling head which tilts 15° either side of center for quick and simple clearance angle adjustments. Covet Mfg. Co., Benton Harbor, Mich.

**39. Plug Gages.** New approaches to gaging problems are pictured and explained in four-page booklet, showing suggested uses of Tenth Plug gage kits and Precision Micro Ball gage kits. Deltronic, 929 Baker St., Costa Mesa, Calif.

**40. Milling Machines.** Toolmaster milling machines are available in four different styles: 1B, 1C, 1D, and 1E, the difference between each model being the spindle carrier design. All other machine extras are identical. Publication covers by description and illustration design highlights and benefits, Toolmasters on the job, dimensional drawings, specifications, functional diagrams, and standard equipment. Milling Machine Div., The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

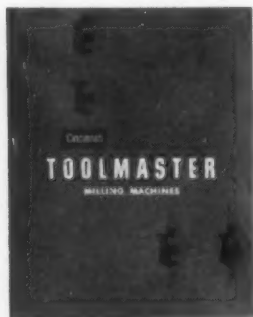
**41. Transfer Machines, Dial Feeds, Indexing Components.** Catalog No. 160 is a 40-page compilation of standard roller gear drive indexing mechanisms, high speed precision index tables, in-line transfer machines and allied equipment. Complete load ratings, dimensions and installation data are presented in table form. Ferguson Machine Corp., 7818 Maplewood Industrial Court, St. Louis 17.

**42. Thread Rolling Head Bulletin F-99-3** has been revised recently. Prior to the revision, the bulletin covered in detail the No. 5 and No. 7 thread roll heads. Included now is the No. 3½ thread rolling head, having a N.C. and N.F. range from 7/16" to 1¼". Landis Machine Co., Waynesboro, Pa.

**43. Miniaturized Toggle Clamps.** "Tiny Toggle" and miniaturized clamps are described in Bulletin No. 102105. Featured are De-Sta-Co Series 102, miniaturized, vertical-handle toggle clamps, and an improved De-Sta-Co Series 105 horizontal-handle "Tiny Toggles." Detroit Stamping Co., 340 Midland Ave., Detroit 3.

**44. Deep Hole Drilling,** its development and general description of the drills used, is covered in folder, which also provides the specifications needed for ordering the deep hole drill tips, shanks, and bushings. Pratt & Whitney Co., Inc., 22 Charter Oak Blvd., W. Hartford 1.

**45. Printed Circuit Board Drilling** machines. Brochure explains how Micro-Path gives a choice of two machines—Model MC for manual control and the automatic Model MPC operating with



(See Number 40)

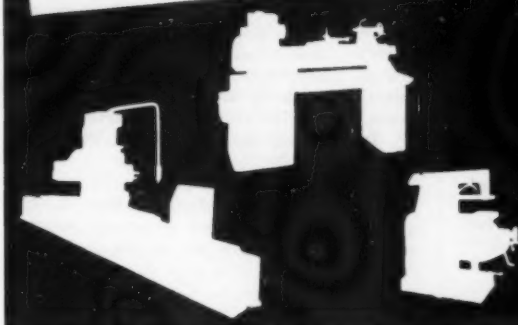


See Number 41)



(See Number 42)

# Standardize Your Pumps



Model  
5 P3

## Ruthman **GUSHER** COOLANT PUMPS

### Give you **PRECISION** at a **PRICE**

Yes, Ruthman Gusher Coolant Pumps are precision built of the very finest materials, yet their initial price is moderate, maintenance cost practically nothing. It will pay you to standardize the pumping on all your metal cutting machinery with Ruthman Gusher Coolant Pumps.

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Flange or Immersed Type  
THERE'S A GUSHER FOR EVERY NEED

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Model  
5 P3

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# NEW FLYNN

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SERIES

## OFFSET BORING HEADS

This new precision offset boring head is designed for  $\frac{1}{2}$ " to 1" bar capacity. Features long, stocky tool block for securing the tool. Vernier simplifies close visual adjustment.

**INTERCHANGEABLE ARBORS AND SHANKS  
SAFETY ROUND CONTOURS**

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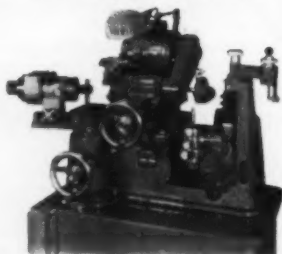
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## TAP GRINDER

Sharpens Chamfers, Flutes  
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Model 1100

- Capacities No. 0 Machine Screw to  $2\frac{1}{2}$ " Hand Taps.

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## FREE LITERATURE continued

magnetic tape control for higher production and greater accuracy. Micro-Path Inc., 4949 W. 104th St., Inglewood 2, Calif.

**46. Vertical Milling Machine.** The Index "45" is emphasized in literature as offering highest efficiency due to ease of operation and convenience of controls. Machine has accuracy of a square overarm which locks without distortion at any point of its travel. Longitudinal travel, 26" to 32", depending on table size; nine spindle speeds from 80 to 2700 rpm; table surface, 40"x 9". Index Machine Co., 543 N. Mechanic St., Jackson, Mich.

**47. Standard Terminal,** the Miller re-coil, provides a simple and practical mounting for work coils to fit all induction heaters. Illustrations and diagrams point up its usefulness. L. C. Miller Co., 5005 E. Slauson Ave., Los Angeles 22, Calif.

**48. "Maintenance of Unitized Tooling"** enables the reader to apply many efficiencies plus cost and time saving suggestions to his own unitized tooling. The 20-page booklet is written by Mr. Ray I. Smith, Jr., industrial engineering supervisor at the Butler Mfg. Co. of Galesburg, Ill., reportedly the world's largest user of unitized tooling. Punch Products Corp., 3800 Highland Ave., Niagara Falls.

**49. Vises.** The Desmond-Simplex vises, as covered by illustrations, descriptions, and dimensions, include machinists' vises, drill press and milling machine vises, woodworkers' vises, etc. The Desmond-Stephan Mfg. Co., 224 S. Walnut St., Urbana, Ohio.



(No. 46)



(No. 47)

MACHINE and TOOL BLUE BOOK

**50. Saw Blades.** Band saw blades and hand hack saw blades are described in folder. They are available in all widths and tooth sizes and are sold in all widths, joined and precision welded to any length or in 100' and 500' coils. Complete specifications are provided. Hakansson Industries Inc., 12933 S. Stony Island Ave., Chicago.

**51. Milling Machine Arbors and Adapters.** A new folder discusses the new line of J & S No-Bend milling machine arbors and adapters with live bearing supports. The arbors are interchangeable with 40 to 50 taper adapters. J & S Tool Co., 87 Dorsa Ave., Livingston, N.J.

**52. Straight Thread Cylinder Ports,** for Hannifin Series "H" hydraulic cylinders, are presented in Bulletin Supplement S-113-1A. A table helps determine the proper straight thread port sizes for 1½" through 8" bore cylinders. Hannifin Co., Des Plaines, Ill.

**53. "The Root of the Thread."** Actual Achilles heel of properly made tension bolts and screws is the shape at the bottom or root of the screw thread. This root should be larger, rounder, and better controlled on fasteners. This pamphlet provides designers and fastener users with a thorough review of the situation. Standard Pressed Steel Co., Box 336, Jenkintown, Pennsylvania.

**54. Salt Bath Furnace.** Bulletin No. 151, "Lindberg-Upton Salt Bath Furnaces," describes and illustrates the advantages of the graphite "continuing" electrodes in salt bath furnaces. Lindberg Engineering Co., 2450 W. Hubbard St., Chicago.

**55. Guide to Thread Gaging.** A new catalog has been published on the complete Johnson line of Ring-Snap, Roll-Snap Comparators. Included also is essential technical information, including recommended gaging procedures. The Johnson Gage Co., Bloomfield, Conn.

## B.S.A. CHUCKS

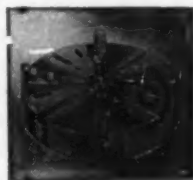
Medium Duty • Precision Made in England



**MODEL 580**  
Self-centering  
Geared Scroll  
**UNIVERSAL**  
Three Jaws

Includes 1 Set External Jaws, 1 Key  
1 Set Internal Jaws,  
3 Pinions, 3 Belts

SIZE IN.	WEIGHT (Lbs.)	CHUCK BORE	PRICE
3"	3½	¾"	\$ 35.75
4"	8	1"	35.75
5"	12	1½"	41.50
6"	17½	1-9/16"	48.00
7½"	29	2"	56.50
9"	42	2½"	71.50
10½"	62	3"	88.50
12"	88	3"	120.00
15"	143	3½"	180.00
18"	200	4"	261.00
21"	262	4½"	320.00
24"	324	4½"	390.00



**MODEL 550**  
4-JAW INDEPENDENT  
**CHUCK**

Includes 4 operating  
screws, 4 Reversible  
Jaws, 4 Belts, 1 Key

SIZE IN.	WEIGHT (Lbs.)	CHUCK BORE	PRICE
4½"	8	1"	\$ 30.50
6"	16	1-9/16"	35.00
8"	34	1¾"	51.00
10"	60	2"	62.50
12"	80	2¾"	74.50
14"	98	3"	84.00
16"	126	3"	105.00
18"	166	4"	140.00
20"	204	4"	165.00
22"	246	5"	205.00
24"	322	5"	220.00
30"	490	5½"	340.00

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Thor Uni-Tork screwdrivers and nut setters make torque control of threaded fasteners as simple as turning on a light. Operator judgment and guesswork is gone. Uni-Tork snaps out of engagement when desired torque is reached, snaps in again when applied to the work. Thor Uni-Tork air tools have ex-

ternal torque adjustments from 10 to 100 inch-pounds. Available on all Thor air screwdrivers and nut setters and on Thor electric tools. Your Thor factory representative or distributor will show you the tools that think for themselves. Thor Power Tool Company, Aurora, Illinois. Branches in all principal cities.

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Francis A. Pratt  
(1827-1902)



Amos Whitney  
(1832-1920)

## *Pratt and Whitney View 100 Years' Progress*

**West Hartford, Conn.**—Pratt & Whitney Co., Inc. of West Hartford, one of the world's largest manufacturers of machine tools, cutting tools and gages, celebrated its 100th birthday in May.

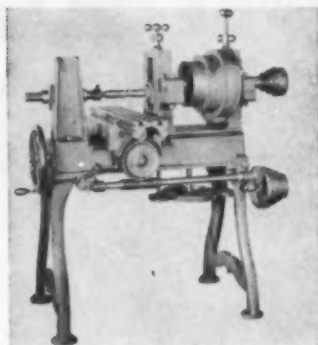
**Francis A. Pratt** and **Amos Whitney** founded the company in Hartford in 1860. Beginning as a two-man shop, its founders operated in off-hours from jobs in another Hartford factory. Today production comprises some 2,000 different items spanning the entire range of the machine tool, gage and cutting tool industry. Products include completely automated tape-controlled machine tools and automated gaging systems capable of the supreme accuracies demanded by the Space Age.

The plant on Charter Oak Boulevard has been

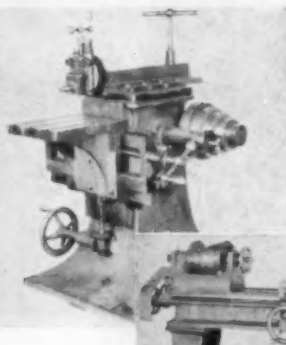
Pratt & Whitney's present home in West Hartford.



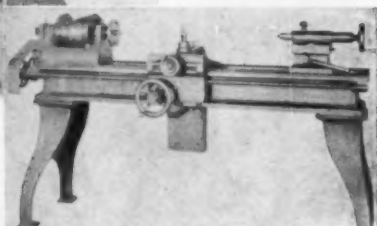
*It started like this in 1860 . . .*



(Fig. 1)



(Fig. 2)



(Fig. 3)

(1) Among the first machine tools built by Pratt & Whitney about 1860 was this "Lincoln" power miller named for President Lincoln. (2) This horizontal shaper was also built circa 1860. (3) In 1865, the firm built its first lathe with weighted carriage. These three P & W machines are preserved in the Ford Museum's collection of early machinery at Dearborn, Mich.

its home since 1940. Formerly famous Charter Oak Park, 14 modern buildings cover approximately 115 acres of beautiful lawns, trees and recreational areas. Some 3,000 employees report for work each day. Mostly highly skilled workers, they come from 97 Connecticut cities and towns. Of these, 597 employees have been with the company for 25 years or longer.

Special events began May 7 when the 597 members of the Quarter Century Club held their annual banquet at the Hartford Club. Employees and their families happily gathered for the 100th Birthday Party on May 14. Culmination of the 12-day celebration was the Centennial State Dinner, May 18, which brought together more than 300 of Connecticut's civic, business and industrial leaders. Gov. Abraham Ribicoff gave the principal address of the day.

In a message sent to **Jacob J. Jaeger**,



**Jacob J. Jaeger**, president

president, congratulating Pratt and Whitney and its workers, Gov. Ribicoff wrote, "Industry provides the foundation of Connecticut's economy, and Pratt & Whitney Co., Inc., is one of the foundation stones of Connecticut industry. The state is proud of your energy, your skill and the quality of your craftsmanship," he added.

# MOORE ROTARY TABLES

For angular spacing jobs so precise you could never handle them before

NO. 2 ULTRA-PRECISE TABLE

**Reads direct to 1 sec.**



Total error  
in any position:  
2 sec.

NO. 2 PRECISION TABLE

**Reads direct to 5 sec.**



Total error  
in any position:  
6 sec.

**GUARANTEED POSITIONING ACCURACY FOR SHOP USE**

All points in 90° increments, from zero to  $\pm 1$  sec.  
All points in 18° increments, from zero to  $\pm 1\frac{1}{2}$  sec.  
All points in 2° increments, from zero to  $\pm 1\frac{1}{4}$  sec.  
Worm accuracy— $\frac{1}{4}$  sec.  
Repetition of settings— $\frac{1}{2}$  sec.  
Total error in any position—2 sec.  
2 sec. = 0.00005" ( $\frac{1}{2}$  tenth) on 10" dia.

Now...with this new No. 2 Moore Ultra-Precise 11-inch 2 sec. Rotary Table—you can provide the closest precision angular spacing needed today. It reads to 1 sec. and has an overall performance accuracy of  $\pm 2$  sec. throughout the entire 360°. It is being widely used in angular locations for guidance systems. A nondisengageable, thread-ground worm, combined with the accurately spaced teeth of its mating gear, makes this extreme precision possible. Loss of accuracy, due to repeated throwing in and out of the worm, is eliminated.

**GUARANTEED POSITIONING ACCURACY FOR SHOP USE**

All points in 90° increments, from zero,  $\pm 1\frac{1}{2}$  sec.  
All points in 18° increments, from zero,  $\pm 2$  sec.  
All points in 2° increments, from zero,  $\pm 4$  sec.  
Worm accuracy—2 sec.  
Repetition of settings—1 sec.  
Total error in any position—6 sec.  
6 sec. = .00015" ( $1\frac{1}{2}$  tenths) on 10" dia.

This popular No. 2 Moore Precision 11-inch Rotary Table has an overall performance accuracy of  $\pm 6$  seconds throughout the entire 360°, and reads direct to 5 sec. It is being used successfully by leading companies on government-sponsored precision jobs never before accomplished. You can use this rotary table for countless precision spacing applications on jig borers and jig grinders.

Write today for descriptive literature about the Moore 2 sec. Ultra-Precise and 6 sec. Precision Rotary Tables.



Accuracy assured by interferometric inspection and calibration, the first time industry has used light-wave measuring methods for precise division of the circle.

These rotary tables are accurate in either horizontal or vertical position. Further applications are possible by using the table in conjunction with its companion unit, Model No. 2 Sine Plate.

**MOORE SPECIAL TOOL COMPANY, INC.**  
728 Union Avenue, Bridgeport 7, Connecticut

## ADD TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

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June, 1960

193

## Dean Strand solved an unusually



Dean Strand's many years as an Abrasive Specialist and a salesman for machinery that uses grinding wheels have covered most of the problems in the book. That's why he so often finds practical solutions that are not in the book.

**PROBLEM** - An unusual grinding problem faced Illinois Tool Works, Chicago, when they began manufacturing a special steel gear shaper cutter. They required a grinding wheel that would generate an involute curve on the sides of the gear shaper cutter teeth, grinding with the side instead of the periphery of the wheel.

In attempting this grinding operation with competitive wheels, production was delayed by the wheels breaking down, glazing or mutilating the gear-teeth walls. It was impossible to maintain the involute shape of the teeth within specified accuracies.

**SOLUTION** - Bay State Abrasive Specialist Dean Strand was called in and went over every detail of the operation. He recommended a 16" diameter x 5/8" thick wheel with a highly friable aluminum oxide abrasive and a special Bay State vitrified bond modification, on Illinois Tool's gear-shaper-cutter grinding machine.

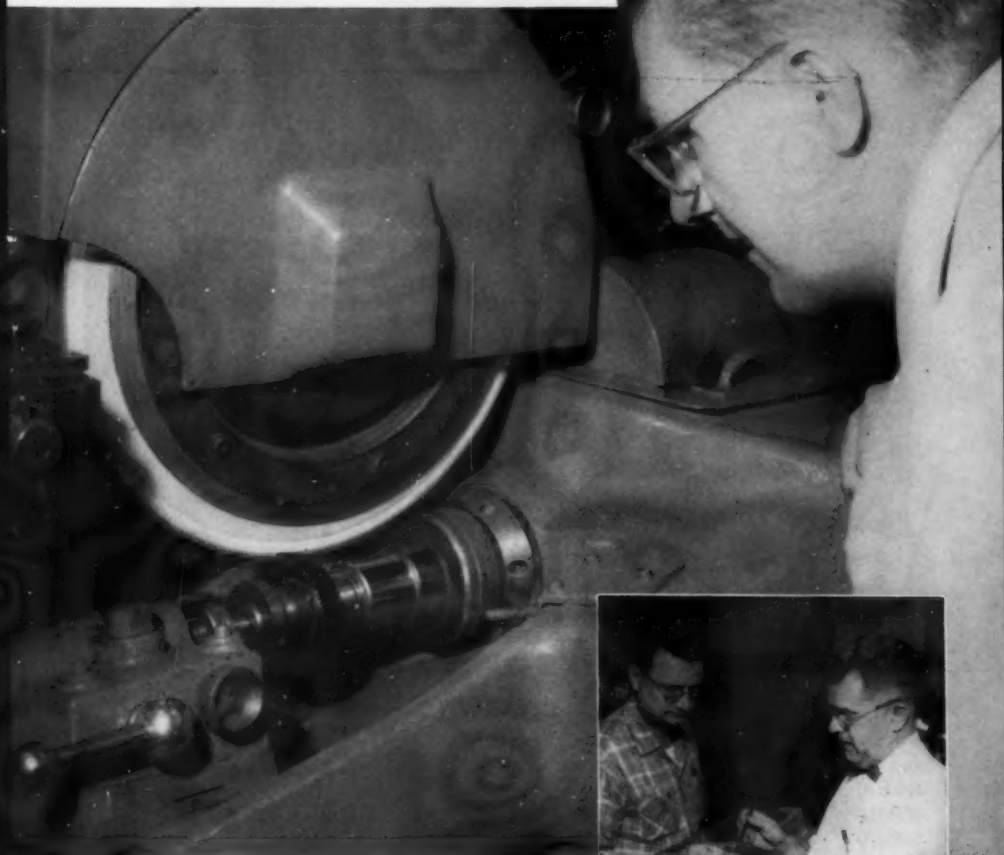
**RESULT** - No further problems on this gear finishing application! The wheel consistently maintains accuracies to within 1/10,000-inch and, in the words of Illinois Tool's Process Engineer Ed Leighton, "we wanted a wheel that would grind without glazing, that would stand up under these unique conditions, that would give us reasonable wheel life and would enable us to get real production out of our machine. Well, thanks to Dean Strand, we've got it."

Like Dean Strand, the Bay State Abrasive Engineer in your area is a trained expert. He backs up the work of the experienced men who represent Bay State's topflight distributors; and Bay State's research labs back them both with new ideas, techniques and materials. *Better grinding at lower cost . . . that is our business.*

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MACHINE and TOOL BLUE BOOK

## difficult grinding problem at Illinois Tool Works



(Above) Operator Dale Jackson at his gear-shaper cutter-grinder equipped with a Bay State 16 x 5/8-inch aluminum oxide abrasive wheel. Grinding is done by side of wheel instead of face. 1/10,000" accuracy is consistently maintained.

(Right) Process Engineer Ed Leighton and Inspector Leroy Wegner, of Illinois Tool Works, checking the tooth angle on a gear-shaper cutter. Extreme accuracy of the helical lead, and its involute shape, are vital to the completed product.



# BAY STATE ABRASIVES

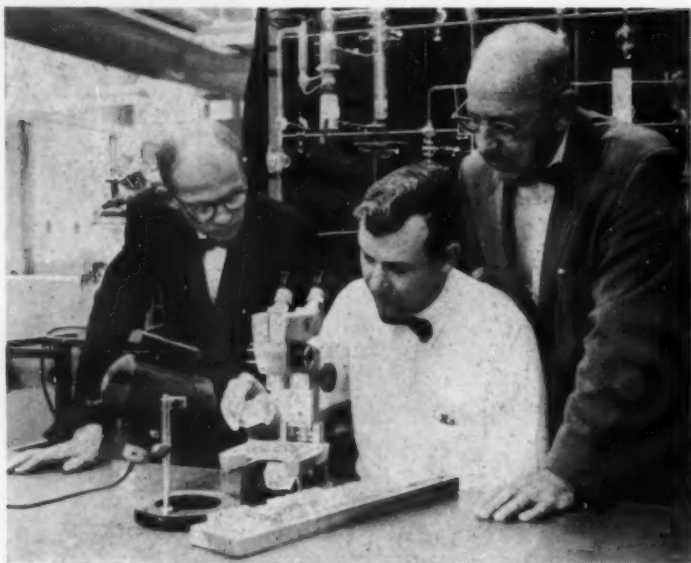


● Bay State Abrasive Products Co., Westboro, Massachusetts.

In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.

Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. Distributors: All principal cities.

## Norton Co. Successfully Makes Diamonds



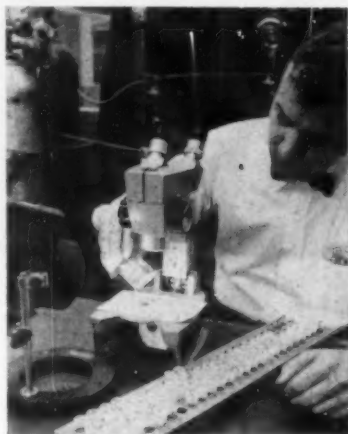
Examining Norton Co.'s man-made diamonds are, left to right: Loring Coes, Jr., assistant director of research and development; Dr. Paul P. Keat, senior research engineer; and Wallace L. Howe, vice president and director of research and development.

Norton Co. has successfully made diamonds, **Milton P. Higgins**, president, stated. This announcement confirms statement to this effect which appeared in the South African press last year.

Norton's active interest in diamond synthesis began in the early forties. At that time a project to investigate the effects of high pressure and temperature on carbon, supported in part by Norton Co., was carried out under the direction of **Professor Percy B. Bridgman**, Nobel Prize winner and professor of physics at Harvard University's School of Engineering. This project was concluded in 1946.

The current project, which led to successful synthesis of the diamond, was given added impetus in 1953 at the Worcester laboratories of Norton Co.

Basic ideas for equipment and processes were formulated and carried forward to successful conclusion by a team



Ready to examine Norton Co.'s man-made diamonds under a microscope is Dr. Paul P. Keat, senior research engineer and member of the team which developed this artificial diamond.



of Norton researchers headed by **Loring Coes, Jr.**, assistant director of research and development, and **Dr. Paul P. Keat**, senior research engineer. **Milton F. Beecher** (now retired) was vice president and director of research and development at the outset; and **Wallace L. Howe** (present vice president and director of research and development) at the conclusion of the project.

Applications for patents on both processes and apparatus have been filed.

No commercial production is anticipated at the present time, Mr. Higgins said.

Coincidentally, the announcement of this development falls in Norton Co.'s "Diamond Jubilee" as 1960 marks the 75th Anniversary of the founding.

# **National Broach & Machine Co. Sets Up Computer Laboratory**

Establishment of a new computer laboratory within the engineering de-



***You can't afford it!***

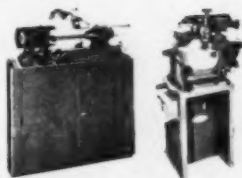
As the pictures show, taps cost roughly 6 times as much as drills. Yet it's common practice to re-sharpen the drill — and throw away the tap.

It doesn't make sense. And it's an awful waste of money.

That's where Blake comes in.

Blake makes low cost, high-precision tap grinding equipment. These easy operating tools can make your taps last up to 6 times longer . . . reduce work spoilage . . . enable taps to cut more accurately and uniformly with less strain . . . cut tap costs as much as 65%.

It's surprising how many people overlook this proven, basic method of saving money. Be sure you don't. Ask us for complete information.



**Blake Chamfer Grinder/Blake Flute Grinder**

used in combination, create or restore:

1. exact indexing of cutting edges.
2. controlled rake angles for each job.
3. correctly ground spiral points.
4. perfectly relieved chamfers . . . make one tap do work of six!

**EDWARD BLAKE**

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COMPANY, INC., WATERTOWN, MASSACHUSETTS WA 6-0100



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Carrying out gear production tool analysis on Bendix Alpha-Numeric electronic computer in the new computer laboratory at National Broach & Machine Co.

partment of **National Broach & Machine Co.**, Detroit manufacturer of gear production equipment and broaching tools, is announced by **Walter S. Praeg**, president. The laboratory has been installed, Praeg explained, to meet the needs of modern industry for high-quality, accurate gears of maximum load-carrying capacity.

The company will use electronic digital computer equipment, as illustrated, in the design of gear shaving cutters, gear honing tools, master gears and broaching tools. Extensive analytical work on the design of gears and splines and related tooth shapes will also be carried out on the new equipment.

#### **Set Lease Plan For Verson Allsteel Presses**

A long-term lease plan for its complete line of standard and custom steel presses and press brakes was announced by **Verson Allsteel Press Co.**, Chicago. The announcement was made

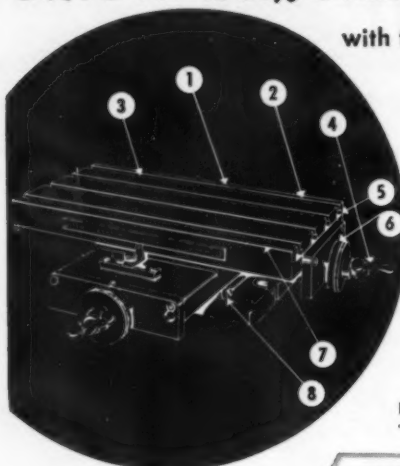
## **SAVE... 10-60% on Multiple Radii and Angle Milling**

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## **PRECISION**

### *Cross Slide Table*



1. Lightweight Meehanite Castings
2. All Ways and Gibs are hand scraped
3. Top and Bottom are precision ground
4. Heat treated lead screws with 2 1/2" bronze nuts reduce backlash to a minimum
5. 4 Tee Slots with 6" scales on each slide
6. Dials graduated from .001"-.50" per revolution
7. TOP 8" x 12"; Length 15"; Ht. 4"; Wt. 60 lbs.
8. Locking device eliminates chance of table moving

For all precision work on Mold Cavities — Plungers — Dies — Templates and other intricate milling.

For further details write

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jointly by Melvin D. Verson, vice president-administration, of Verson, and



Signing the agreement setting up a long-term lease plan for all presses and press brakes made by Verson Allsteel Press Co. is Melvin D. Verson, vice president-administration, at left. Looking on is Robert Sheridan, president of Nationwide Leasing Co., Chicago, which is underwriting the program.

Robert Sheridan, president of Nationwide Leasing Co., Chicago, which will underwrite the lease program.

"Our new lease plan, which features terms starting at three years, will enable many of our customers to install more modern equipment immediately without reducing their working capital resources," Verson said. "In many cases, savings produced by the new equipment will more than cover the monthly lease payments for the presses. Our lease plan also will enable metal fabricators to replace obsolescent machinery more rapidly than heretofore, since it represents virtually 100 per cent financing for them."

Further information on the lease plan may be obtained by writing to the Verson Allsteel Press Co., 1355 East 93rd St., Chicago, Ill., or Nationwide Leasing Co., 11 South LaSalle St., Chicago 3, Ill.

## INDEXING MACHINERY — CAMS — GENEVA GEARS — TURNTABLES

EISLER MAKES OVER 300 DIFFERENT TYPES OF INDEXING TURNTABLES. SPECIAL MADE TO YOUR SPECS. WRITE FOR CATALOG.



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### G&L Bickford New Trade Name of Cincinnati Bickford Drillers

The trade name of Cincinnati Bickford radial and upright drilling machines has been changed to G&L/Bickford, according to an announcement from George K. Cassady, general sales manager, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. The new name will also be applied to universal radial drilling machines built by Giddings & Lewis in Kaukauna, Wis.

Mr. Cassady stated, "This name change is being made concurrent with the sale of our Cincinnati plant and centralization of drilling machine manufacturing in our Wisconsin facilities. Field sales, service, and distribution will remain unchanged. Internal operations will be headquartered in Wisconsin."

Giddings & Lewis has owned the Cincinnati Bickford line of drilling machines since 1955 when it purchased the old Cincinnati Bickford Tool Co.

**Bay State Abrasives Buys West Coast Diamond Wheel Firm**  
Bay State Abrasive Products Co., Westboro, Mass., has purchased the Felker Manufacturing Co. of Torrance, Calif.

Felker manufactures diamond abrasive cutting wheels used in many industries, such as construction, marble and granite, and building. They also manufacture machines and accessories used in these industries.

The Felker Co. will be operated as a wholly owned subsidiary of Bay State under the direction of vice president, Elden L. Aufer. Lester F. Kusmick will be retained as manufacturing manager and Fred K. Ryan as sales manager.

### Medelton Co. Moves

Medelton Co., Inc., manufacturers of the Powerroll and Grip-Feed coil cradles and Clean-Oiler stock oiler announces its removal to new larger quarters at 262 E. 3rd St., Mount Vernon, N.Y.

## ALLEN HEAVY DUTY PUNCH PRESSES

### Moderate in Price

Hundreds of different Model Combinations  
1 to 12 ton Capacities

### Powerful Dependable and Economical Fully Guaranteed

See your Supply Dealer or write for catalog giving complete information, specifications and prices on our line of Heavy Duty Punch Presses.



**Model BT-12**  
12 Ton—\$437.50  
less motor—job

**Model BT-8**  
8 Ton—\$347.50  
less motor—job

**Model BM-4**  
4 Ton—\$299.00  
less motor—job

**Model D-2**  
2 Ton—\$97.50  
less motor—job

**Model LTX**  
Special Duty  
1 Ton—\$89.50  
less motor—job

**Thousands in use the World over**

**ALVA ALLEN INDUSTRIES, Dept. MTB Clinton, Missouri - Tel. Turner 5-3331**

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## E. F. Houghton Co.'s New Home



Air view of new plant of E. F. Houghton & Co., manufacturers of industrial oils and chemicals, 54 Tanforan Ave., South San Francisco. Newly installed equipment includes provision for sulphonation, saponification, compounding, esterification, and condensation reactions. Plant manager is A. S. Horwitz.

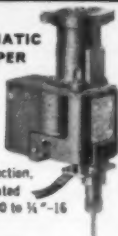
## COMMANDER TAPPERS

**LEAD-MATIC  
TAPPER**



Lead Screw Tapper  
Range: 0-80 to  $\frac{1}{8}$ "-16

**PNEU-MATIC  
TAPPER**



High Production,  
Air Operated  
Range: 0-80 to  $\frac{1}{8}$ "-16

**MULTI-  
TAPPER**



taps 2 to 15  
holes at 1 stroke.  
Adjustable  
hole pattern

**MIDGET  
TAPPER**



Pressure Sensitive Drive  
Range: 0-80 to 10-24

**STANDARD  
TAPPER**



Adjustable  
Torque Control  
Range: 0-80 to  $\frac{1}{8}$ "-16

## a Type and Size for Every Job!

Commander Tappers are made in 10 models—each designed to handle tapping jobs over a wide range. From the Commander Tapper line, you can select the right unit to give you the exact performance your job requires. Whichever Commander Tapper you select, you will get unequalled performance and tapping economy. Sold and serviced by drilling and tapping specialists. Write for the Commander Production Tool Catalog and name of nearest Distributor.



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Want to save  
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*...then  
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**kipp**

**AIR GRINDERS**

MODEL JA  
50,000 RPM

**\$60<sup>00</sup>**

IN U.S.A.



Weight, 12 ounces;  
length, 6 3/4 inches;  
chuck size 1/4 inch.  
Wheel guard removed.  
for better illustration.

Here is a fast approach to saving valuable tool room hours. Designed by toolmakers for toolmakers, this reliable off-hand grinder is still the top drawer tool in thousands of tool rooms everywhere.

**FREE GRINDING WHEEL CHART**

Included with Kipp Air Tool Catalog AT-3007. Your copy will be mailed promptly at your request.

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202

**Specialty Gaging Sales Agency  
Formed in New England**

Recognizing the increasing need for practical engineering and technical assistance in the specification and procurement of precision gaging and measuring equipment, David M. Gaskill and William T. Nystrom have formed Gaskill, Nystrom & Co., Inc., a new sales engineering agency tailored specifically to New England industry. Address is: 761 Park Ave., Cranston, R.I. Resident sales engineers will be located in Boston, Hartford and Albany.

As a background in experience, Mr. Gaskill was successively sales manager for Cleveland Instrument Co., Brush Instruments, and Airborne Instruments Laboratory. Mr. Nystrom, for ten years with Brown & Sharpe Mfg. Co., was previously with Taft-Peirce Mfg. Co.

**Wright & Gade Tool Co. Named  
Nebel Lathe Representative**

The appointment of Wright & Gade Tool Co., North Broad St., Philadelphia, as distributor for Nebel lathes in Eastern Pennsylvania, Southern New Jersey and Delaware, has been announced by The Nebel Machine Tool Corp., Cincinnati. Wright & Gade will feature the complete "60th Anniversary Line" of entirely new, proven design Nebel heavy duty lathes, including the new HXB 26/45" heavy duty extension bed gap lathe, with more and higher spindle speeds than ever before offered by Nebel.

*"Specialization  
Creates Perfection"*

**Comet. BORING TOOLS**

(H. S. S. and Carbide) for Holes from 1/16" upward  
Standard and Special Boring, Facing and  
Internal Threading Tools. Write for Data.

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**COMET Tool Co.**

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MACHINE and TOOL BLUE BOOK



### Seibert & Sons Open Detroit Branch Office

Seibert & Sons, Inc., Chenoa, Ill., manufacturer of production holding tools, tool control boards, and spindle equipment, has opened a Detroit factory branch office at 18926 Schoolcraft, phone VERmont 7-5951. The company has moved its warehouse to this same location.

Operation is under the supervision of Dennis P. McCormick.

### Barrett Names Representatives

Four new sales representatives to serve areas in the Midwest and West Coast have been appointed by **The Leon J. Barrett Co.** of Worcester, Mass. The companies and their territories include: **Lor-Mac Associates** (Detroit); **The Aldrich Co.** (Cleveland); **W. A. Borden Co.** (San Francisco), and **Stearns Sales Co.** (Los Angeles).



**NEW PINES**  
**HIGH PRODUCTION**  
**END FINISHER**

for  
● TUBE  
● ROD  
● PIPE

**New Model 660 Speeds Chamfering • Deburring • Facing • Drilling • Reaming • Tube-End Forming**

- Rugged new design for high production, easy operation, faster feeds on simultaneous inside-outside deburring, chamfering, facing.
- New rigid, unitized spindle frame and heavier base retains close concentricity between the tool holder and chuck jaws.
- Simplified setup, operation, maintenance . . . one-minute speed changes with new hinged safety guard and pivoted motor mount.
- Production to 800 ends an hour . . . capacity to 2" O.D. . . air operation, larger units or special machines are also available.

Write for catalog giving cost cutting features, production data, complete specifications.

**PINES** ENGINEERING CO., INC.  
Specialists in Tube Fabricating Machinery 605 WALNUT • AURORA, ILLINOIS

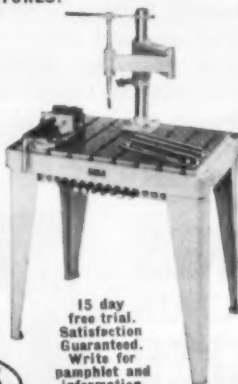


## Allman Universal Hand Tapper 5 TIMES FASTER

A great time, labor and material saver. Fixture taps five holes to every one using the free hand method. Eliminate costly tap breakage.

### CHECK THESE FEATURES:

- Articulate arm swings clear of large table for placement of work.
- Limitless number of sizes of tapped holes without moving work piece.
- Vise holds work as small as  $\frac{1}{8}$ " square.
- Floating tap locates itself in hole.
- Individual spindle holds taps, thus change requires only seconds.



15 day  
free trial.  
Satisfaction  
Guaranteed.  
Write for  
pamphlet and  
information.

**TOOLS,  
INC.**

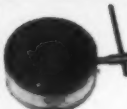
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- Precision made
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Size (Inches)	Height (Inches)		
4 x 6	2 1/2		\$ 57.50
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6 x 10	2 1/2		80.50
6 x 14	2 1/2		103.50
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4		\$ 42.55
6		71.30
8		101.20

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## Syntron Co's President Retires



C. S. Weyandt



B. K. Hartman

Carl S. Weyandt, president and one of the founders of Syntron Co., Homer City, Pa., retired recently after more than 40 years' service. He is succeeded by **Byron K. Hartman**.

Mr. Weyandt was elected vice president and general manager in 1921 when the company was located in Pittsburgh. He assumed the presidency shortly after the company relocated in Homer City in 1937. He will now continue as a member of the board of directors of Syntron, and of the Link-Belt Co., Chicago, of which Syntron is a subsidiary.

Mr. Hartman joined the company as executive vice president and general manager in August, 1959. Previous to that, he had been associated with the Link-Belt Co. for 21 years.



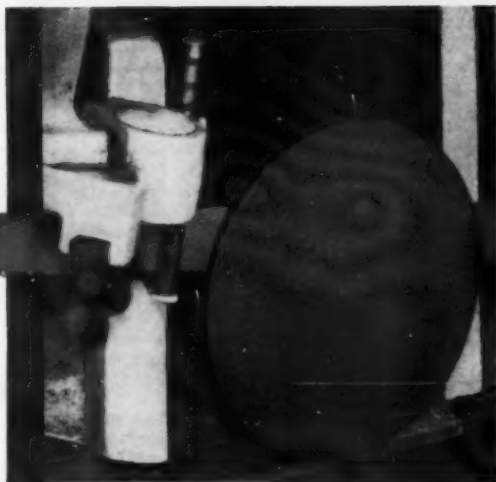
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## **COSTS DOWN**

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HIGH SPEED STEEL  
BANDS**



The new Barnes High Speed Steel Band Saw Blades out-cut and out-last carbon steel bands many times over. They also cut with ease most of the hard-to-machine alloys that carbon blades cannot cut.

Call your Barnes distributor for the facts on the best in precision cutting tools—Barnes High Speed Steel Band Saw Blades.



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## Appointments and Promotions

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### Personnel Changes . . . Executive and Production

---



H. A. Waddell



H. R. Odell



W. L. Lukens

**Harvey A. Waddell** was elected vice president of the Gisholt Machine Co., Madison, Wis. He will continue to serve as company treasurer and as a member of the board of directors in addition to his new duties. . . **Beloit Tool Corp.**, Beloit, Wis., has elected **Henry R. Odell** as executive vice president. One of the founders of the company, his previous position was that of treasurer. He will continue in that capacity. **K. Y. Taylor**, president; **J. W. Oliver**, vice-president, and **K. K. Zabel**, secretary, are re-elected officers. . . **William L. Lukens**, formerly assistant to the president and with the firm 24 years, has been appointed vice president and assistant to the president for National Twist Drill and Tool Co., Rochester, Mich. . . **Russell M. Held** has been named as vice president and general sales manager for the Tamms Industries Co. of Chicago. He has been with the firm since 1935. . . **Frank D. Clark**, a vice president of The Van Keuren Co., Watertown, Mass., has been appointed director of the newly created Thread Gage and Instrument Division. **William Mark**, sales manager, has been elected a member of the board of directors. . . At the annual shareholders' meeting of Latrobe Steel Co., Latrobe, Pa., the following were elected to the board of directors: **James M. Underwood**, **M. W. Saxman, III**, **William E. Howard**, and **W. G. Dahl**. Other officers named were: **M. W. Saxman**, chairman of the board and president; **J. E. Workman**, executive



R. M. Held



F. D. Clark



W. Mark

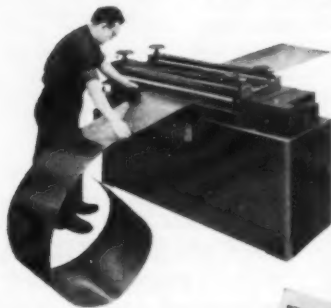


R. L. Stefano

vice president; **H. S. Saxman**, vice president-finance, secretary; **R. T. Eakin**, vice president-operations; **W. G. Dahl**, vice president-sales; **S. G. Fletcher**, vice president-technical director; **A. W. Smiley**, treasurer; **Henry J. Sulkey**, assistant secretary, and **Gene E. McDonald**, general counsel. . . **Donald Henry** has been named assistant general manager of Rockwell Manufacturing Co.'s Belefontaine, Ohio, power tool plant. . . **Edwin R. Smith, Sr.**, president, treasurer, and director for 40 years of the Seneca Falls Machine Co., Seneca Falls, N.Y., has announced his retirement. **Edwin R. Smith, Jr.** was elected president and treasurer of the firm. **Daniel V. McNamee, Jr.**, president of First Albany Corp., Albany, N.Y., was appointed chairman of the board of directors. . . **Lawrence D. Orlick** has been appointed advertising and public relations manager at F. Jos. Lamb Co., Detroit, Mich. . . **Punch Products Corp.** of Buffalo, N.Y., has announced **Rocco L. Stefano** as general manager for the company. . . **Alvin J. Jones** and **D. M. Hallier**

were elected vice presidents of the Motch & Merryweather Machinery Co., Cleveland. In his new capacity, **Jones** will be manager of the Machine Tool Manufacturing Division at the Euclid plant of the company. Recently **Hallier** was made manager of the Cutting Tool Manufacturing Division and the Allied Products Division. **C. R. Kubik** and **D. M. Patterson** were re-elected vice presidents. **Kubik** is manager of the Machine Tool Distributor Division with headquarters in Cleveland and branch offices in Detroit, Cincinnati and Pittsburgh. **Patterson** is manager of the Avey Division in Cincinnati. . . Two executive appointments have been announced by the Scintilla division of Bendix Aviation Corp., Sidney, N.Y.: **Donald S. Jones** was promoted to a new position, executive assistant to the general manager, and **Thomas B. Kreutz** was named director of industrial relations, the position previously held by **Jones**. . . **Charles W. Curtis** was named manager of the newly created components division of Hughes Aircraft Co., Culver City, Calif.

## The best sheet metal ROLLER LEVELER ever built!



### WOEHR ROLLER LEVELERS

(in several standard models)  
flatten steel, aluminum, brass and  
copper in widths up to 60"

. . . in gauges .010 to .125! Your  
fabricating capacity and efficiency  
are increased *immediately!*

Safe, one-man operation is  
simple and accurate.

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## Personnel Changes . . . Sales and Service



R. H. Bruce



D. Armstrong



J. M. Dill

**Robert H. Bruce** was appointed vice president in charge of sales for the Gisholt Machine Co., Madison, Wis. He has been with the firm since 1934. . . **Punch Products Corp.**, Buffalo, N.Y. has announced **Ralph L. Weisbeck** as sales manager for the company. . . **Donald Armstrong** has been named assistant sales manager-field for The Van Keuren Co. of Watertown, Mass. . . The National Acme Co., Cleveland, has elected **Stanley E. Casson**, formerly director of sales, as vice president-sales. He has been associated with the company for 25 years. . . **James M. Dill** has been appointed to the newly-created position of special products sales manager for Russell, Burd-sall & Ward Bolt and Nut Co., Port Chester, N.Y. . . **Behr-Manning Co.** of Troy, N.Y., a division of Norton Co., has re-aligned its coated abrasives sales organization, and has appointed **William J. Bennett** national field sales manager of its Coated Abrasives Division. The sales organization has been regrouped into eastern and western regions with regional sales managers, respectively, **Victor F. Perreault** and **Arthur W. Bell**. . . **Harold D. Ballard** has joined the sales force of The Lincoln Electric Co., Cleveland, and will work out of its Milwaukee office contracting accounts in Milwaukee and the southern part of Wisconsin. Ballard replaces **Donald E. Bly** who has been transferred to Appleton, Wis. to cover northern Wisconsin and the upper peninsula of Michigan for the company.



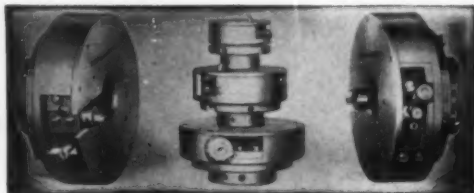
R. L. Weisbeck



S. E. Casson



W. J. Bennett



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## BOOK REVIEWS

**EQUITY CAPITAL AND SMALL BUSINESS.** Edited by Edward L. Anthony. Published by Small Business Administration, Washington, D. C. 35 Cents.

The great majority of small business owners and managers want their concerns to prosper and grow. Two kinds of money are usually needed for growth: The first is temporary capital such as short-term funds borrowed to support bigger accounts receivable or inventories, and long-term loans to finance items like new equipment. The second is permanent or equity capital preferred in financing long-range growth.

This volume is a collection of eight articles on different aspects of equity capital, each by a separate person, rather than a uniform work by a single author. The book contains contrasting opinions, but this presents no conflict as each author brings his own ideas to bear on the subject. After study, the reader can draw his own conclusions.

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- New. Revolutionary double-box Headstock (Pat. Pend.)
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- New. Single-Shift Back Gear Lever on Headstock.
- New. Headstock and Apron running in oil.
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- New. Amazing LOW PRICE.

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This is an all new lathe that bridges the gap between conventional belt driven and geared head lathes. It combines the capacity and power of a geared head with the economy and flexibility of a belt driven lathe. Available with 5', 6' and 8' bed lengths providing 31", 42" and 66" center distances.

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☐ 11" and 13" Variable Speed Lathes

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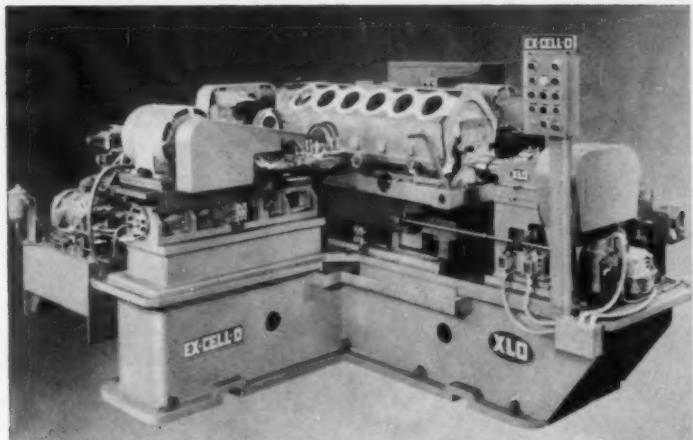
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MACHINE and TOOL BLUE BOOK



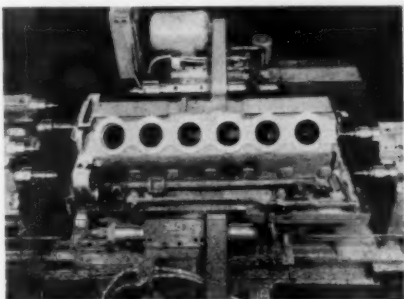
Ex-Cell-O custom precision boring machine for multiple operations on V-12 engine crankcase.

## **BUILDING BLOCK CONSTRUCTION FOR BORING MACHINE**

This custom precision boring machine uses standard machine slides and other building block components, including a total of eight precision boring spindles.

The workpiece, a massive aluminum alloy V-12 engine crankcase is manually clamped on the fixture table, this being carried on a standard hydraulic slide. Two other standard slides are used to feed boring and facing heads toward the part. These latter slides "rapid" into cutting position at the start of the machining cycle. The slide carrying the fixture table feeds from left to right toward the facing heads. This action also feeds the workpiece toward spindles at the right hand station where two dowel holes are bored and chamfered. In order to extend tool life, an air operated, retractable boring tool is pro-

Work area showing all eight Ex-Cell-O precision spindles which perform a total of 37 operations.



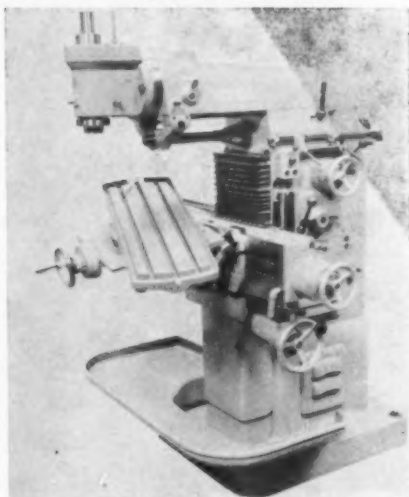
vided on each of these spindles to enable tools to withdraw after their cut is complete.

The machining cycle continues as the fixture rapids to the left, feeding toward the four spindles mounted at that end. After completion of boring and chamfering operations on this front face, the two cross slides retract clear of the fixture table, which now returns to the start position. During the cycle a total of 37 individual cutting operations is performed.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

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### Workpiece May Be Arranged At Any Angle On Machine



Many attachments in tools and clamping devices available.

Advantage of the Thiel Duplex 158 milling machine is that the workpiece may be arranged at any angle relative to the cutting tool and vice-versa. Versatility is provided through the use of attachments in tools and clamping devices.

A wide machining range is offered to accommodate varied size workpieces. Throat depth between vertical milling

cutter and machine column is 27½"; distance between vertical spindle and table surface, 17½". Large workpieces may be clamped on the base table, while smaller components may be set on either a 33" x 16" fixed table or the swiveling table. The swiveling table tilts 30° in each direction and has a cross slide movement of 5½". Vertical and longitudinal table travel is 16", with power feed and rapid traverse in all directions. Horizontal overarm travels 8½" in and out.

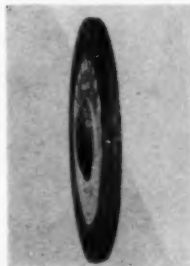
Attachments to choose from include dividing heads, rotary tables, slotting head, powered vertical head, a 5000 rpm max. vertical drilling head, universal spiral milling device, hydraulic copying device, jig grinding head, and small tooling.

United Machine Tool Co., 3620 Santa Fe Ave., Los Angeles 58, Calif.

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### Fast Cutting Grinding Disc

The Fast-Cut Moldisc, a new depressed center abrasive disc, is claimed to cut and remove metal faster than any similar type wheel. Other features reported include: reinforced for maximum safety, uniform cutting action, much longer life, and less operator fatigue.



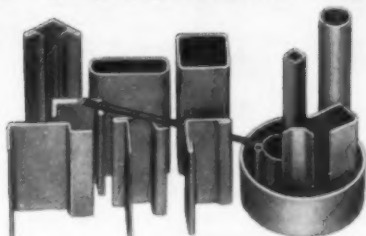
The new wheel is designed for use in fabricating shops for grinding welds and beveling edges, and in foundries for notching gates and risers and trimming fins.

The discs are available in 7" and 9" diameter sizes in 1/8", 3/16", and 1/4" thicknesses.

Abrasive Wheel Dept., Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N.J.

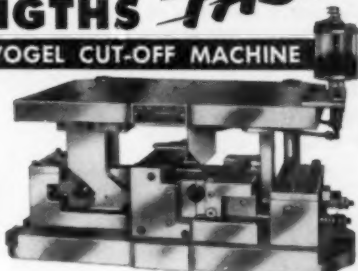
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# SHEARS CLEAN *FAST!* TO ACCURATE LENGTHS



With each press stroke, unit accurately cuts off tubing and shapes into lengths of  $\frac{1}{2}$ "  $\pm .010$ ", or more. The ends are cut clean with a minimum of burr or distortion . . . Shearing blades make thousands of cuts before resharpening.

## VOGEL CUT-OFF MACHINE



No. 12 unit cuts up to  $\frac{3}{4}$ " O.D. x  $\frac{3}{32}$ " wall.  
No. 2 unit cuts up to 2" O.D. x  $\frac{1}{8}$ " wall.  
No. 3 unit cuts up to 3" O.D. x  $\frac{3}{16}$ " wall,  
or up to  $3\frac{1}{2}$ " O.D. x  $\frac{1}{8}$ " wall.  
Odd shapes handled in sizes equivalent to unit's O.D. capacity.

## VOGEL TOOL & DIE CORPORATION

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Model No.	Inside Dimensions			Temp. Range	Watts 110 Volts AC	Price
	Wide	High	Deep			
434DL	4 $\frac{1}{4}$ "	3 $\frac{3}{4}$ "	4 $\frac{1}{4}$ "	325°—1850° F.	920	\$ 90.00
438DL	4 $\frac{1}{4}$ "	3 $\frac{3}{4}$ "	5"	325°—1850° F.	1650	120.00
436DL	4 $\frac{1}{4}$ "	3 $\frac{3}{4}$ "	6"	250°—2000° F.	1650	130.00
50L	4 $\frac{1}{4}$ "	3 $\frac{3}{4}$ "	9"	250°—2000° F.	1750	176.00
90L	6"	6"	6"	250°—2000° F.	2200	200.00
669DL	6"	6"	9"	250°—2000° F.	3000	248.00
100L	8"	4"	6"	250°—2000° F.	2000	220.00
849DL	8"	4"	9"	250°—2000° F.	3000	265.00

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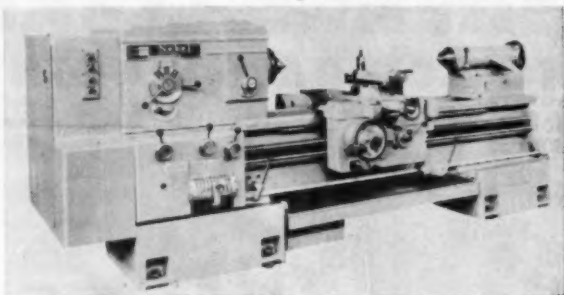
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## Standard Duty Engine Lathe Features Totally Enclosed Gear Box

A new design totally enclosed gear box is one of the many features of the new Model SD 2516-20 standard duty engine lathe. This is the fourth model in Nebel's entirely new line of lathes. It offers convenience as well as precision machining, with more and higher spindle speeds than previously available from Nebel.

The heavy duty quick change gear box combines the advantages of total enclosure with the simple, reliable tumbler gear arrangement.

Sixty separate feeds from .0027 to .192 ipr, and 60 separate thread changes from 1 to 72 threads per inch are selected by removing the shifting handle



Offers convenience, precision machining, more and higher spindle speeds.

to the desired feed or lead shown on the direct reading tumbler index plate. The tumbler gear locks in position.

The new lathe offers 18 gear driven speeds, selected from a direct reading color index and easily controlled by two levers and color keyed speed plates. Speeds up to 1500 rpm, a new Nebel maximum, are available.

The rugged three-bearing spindle is mounted at the front and center supports on zero precision, angular tapered roller type bearings, preloaded and adjusted for maximum radial and thrust loads. A constant speed main drive motor supplies up to 20 hp.

Heavy duty design is evident throughout.

The new design quick change gear box, as well as the other new design features, are also available on the other models in the new line—Model HXB heavy duty extension bed gap lathe, and Models 2516 and 2013 heavy duty engine lathes.

Nebel Machine Tool Corp., 3428 Central Parkway, Cincinnati 25, Ohio.

## Production Milling Machine Offers Automatic Cycling

A new automatic cycling miller has been added to the Sajo (Swedish) line of knee-type horizontal and vertical milling machines. The No. 2 production miller, Model 54, offers a selection of



### scrap choppers

Cooper Weymouth scrap choppers take skeleton strip directly from press — chop it quickly and efficiently into easily handled size for collection. Three self-contained sizes, adjustable angle heads, for stock to .156 x 5" or .093 x 12" (mild steel). Write for details.

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607 Honeyspot Road, Stratford, Conn.

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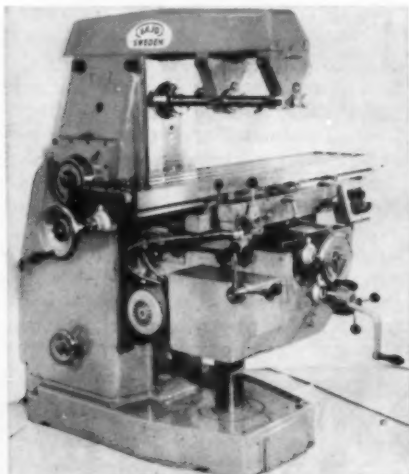


Gaertner Optical Instrumentation  
designed and manufactured in the U.S.A.

automatic table cycles, ranging from conventional one-way milling with return rapid traverse to skip-feed milling and continuous two-way milling with rapid traverse between cuts, with or without spindle braking.

The machine is fully automatic, the operator being required only to load and unload the work.

Changeover from one automatic table



A variety of automatic cycles is available—simple one way cycle, one way cycle with automatic table reverse, skip feed with automatic table reverse, etc.

cycle to another is made in a matter of minutes from the operator's position. The automatic cycling arrangement can as easily be disengaged and the machine used for conventional operator-controlled milling when desired.

The automatic cycling feature is available on either the Model 54 plain horizontal miller or on the Model 54 vertical miller. Table size is 52"x11"; longitudinal power feed, 33½"; spindle, No. 50 NMT; main drive motor, 7½ hp; table feed and rapid traverse motor, 1½ hp.

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N.Y.

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## Coordinate Cathetometers reduce inspection time

Gaertner Coordinate Cathetometers are reliable optical instruments for making precise measurements in the vertical plane. Because they permit reading two coordinates in a single setting, they reduce inspection time and eliminate resetting errors.

In addition to the routine inspection applications, these instruments permit measurements on larger objects as well as objects or points in recessed, remote or inaccessible locations. They eliminate the errors and indecisions associated with mechanical-contact measurements.

Illustrated is Gaertner's M1238-1818 instrument. It has a range of 18" x 18", working distance of 9" to infinity, and reads to 0.001" up to 24" working distance. Protractor ocular reads up to 3 minutes of arc. Larger ranges are available. Smaller types provide reading to 0.0001".

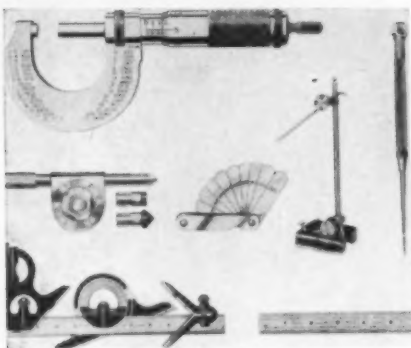
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1221 Wrightwood Ave., Chicago 14, Ill., BU 1-5335

**Gaertner**  
SCIENTIFIC CORPORATION

## 16 New Machinist's And Precision Tools



Under Union's "Sweet 16" promotion 16 new tools now round out the line of professional quality precision and machinist's tools.

Highlighting this promotion is a line of six new accuracy-guaranteed micrometers, measuring by 1/1000ths in capacities of 0" to 1" or 1" to 2". Prices

are \$13.00, \$15.40, and \$19.10 for the 1" micrometers, and \$14.50, \$16.75 and \$21.00 for the 2" models.

Other new tools in the "Sweet 16" line include: combination squares and sets—\$6.85, \$9.10, and \$13.50; 6" steel rules—\$2.28, \$2.43, and \$2.50; speed indicator—\$3.30; pocket scriber—\$.84; 9-leaf thickness gauge—\$.92, and surface gauge—\$7.70.

Union Tool Co., Orange, Mass.

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## Sturdy Cylinder Mounting

A rugged power cylinder mounting is said to permit speedy installation, is guaranteed not to shift, and eliminates the bolting, pinning and/or welding of keys. The mounting is created by providing side mounted cylinders with a flange plate ground to accurate thickness and extending beyond the mounting-side surface of the cylinder. To mount the cylinder, the cylinder user merely has to first slip the extending portion of the flange plate into a slot milled into the machine's mounting

## Make cuts **DEEPER** and **FASTER**

ROOFE Live Centers, praised by users everywhere, are made of finest materials under rigid quality controls.

ROOFE Standard Type Live Centers are popular because they offer maximum accuracy, lower costs, and increased production. Available in Morse Taper, Brown & Sharpe, Jarno. Straight and special shanks furnished to meet your "special" specifications. Write for our catalog.



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**Type**  
**LIVE**  
**CENTERS**

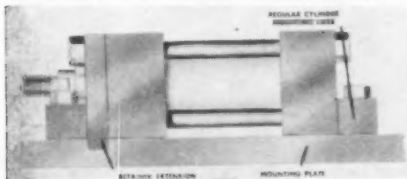
## HOUSTON GRINDING & MFG. CO., Inc.

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MACHINE and TOOL BLUE BOOK

surface, then to secure the cylinder by means of the standard mounting pro-



vided with the cylinder.

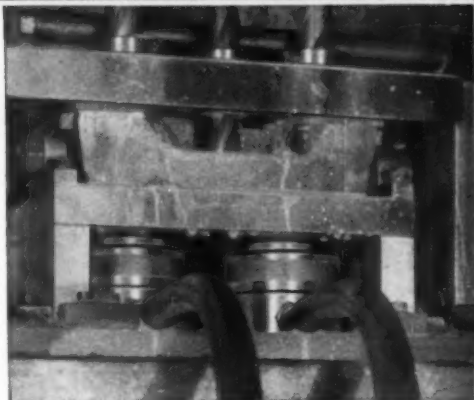
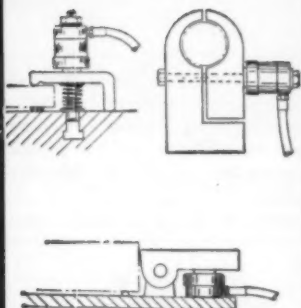
With the flange plate extension thus

locked solidly in the milled slot, cylinder cannot shift under load.

The mounting is available in mounting styles 72 (side lug), 74 (flush side), and 77 (end lug) in all bore sizes of Miller air and hydraulic cylinders and is designated by adding the suffix "k" to these mounting styles.

Miller Fluid Power Div., Flick-Reedy Corp., York and Thorndale Rds., Bensenville, Ill.

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## HYDRAULIC FIXTURE LOCKING COMPONENTS BOOST MACHINE OUTPUT!

- Compact—Builds into fixtures easily
- Automate your fixtures for fraction of "do-it-yourself" cost
- Ultimate speed in work loading
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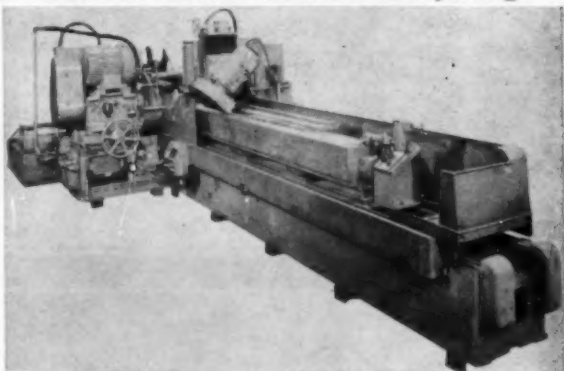
Canadian Address: 178 Norseman St., Toronto, Canada MTBB-60

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## Grinder Equipped With Tracer Head For Contour Sharpening

A method of combining heavy stock removal face grinding with secondary contour cuts has been developed in a machine designed for sharpening rotary crop shears. Mattison Machine Works now equips its standard No. 2000 traveling-table face grinder with an auxiliary swiveling head for contour sharpening. The head floats laterally and is controlled by a tracer to reduce part-handling time and costly special equipment.

Rotary crop shears use a male and female blade to cut a large radius at the leading edge of steel slabs for easier feeding into the rolling mills. Combi-



nation of counterweighting and anti-friction spindle carriage mounting permits the wheel to follow the desired shape, as controlled by the template. Thus compound angles of the blades are ground.

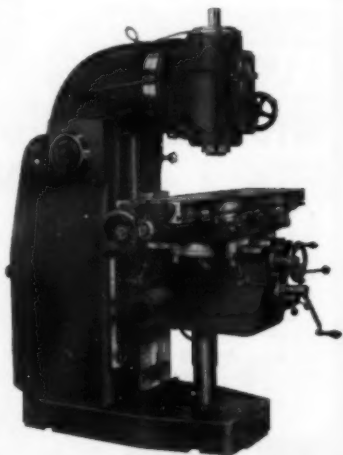
The auxiliary head is easily dressed

## POWER PERSONIFIED SAJO No. 2 Vertical Miller

Just a glance at this rugged machine confirms its ability to perform with ease the most demanding jobs. Sajo's swivelling head, power feed to quill and unrivaled spindle construction combine versatility with unsurpassed tool room accuracy.

Also available —  
Horizontal Millers  
Plain and Universal

No. 2 Vertical Miller  
table size: 52" x 11"  
7½ and 1½ HP motors  
rapid power traverse



**a** austin industrial corporation

76-G Mamaroneck Avenue

White Plains, New York

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by two manually operated dressers mounted on a special base at one end of the table.

The hydraulically driven table on the grinder is pulled in both directions by two opposing cylinders to provide uniform, smooth travel. The outer way is

flat, while the V-shaped inner way takes lateral thrust and guides the table. This design is reported to assure excellent finish and accuracy when grinding shear blades, wear strips, etc.

The face grinder with the head handles work lengths from 50" to 220".

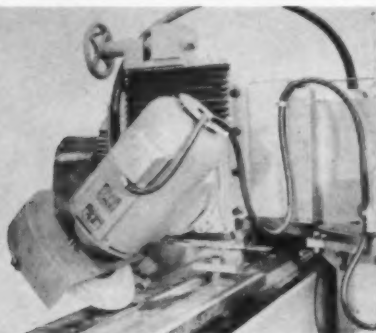
Mattison Machine Works, 545 Blackhawk Park Ave., Rockford, Ill.

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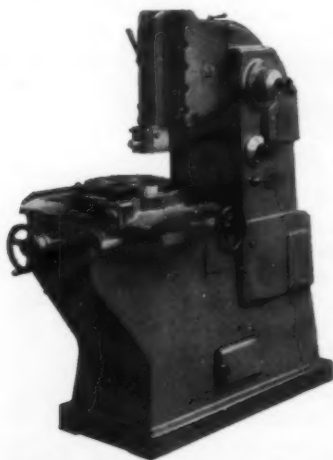
### Cutting Tool Centering Gage

A fast and extremely accurate method of setting lathe-type cutting tools to the work centerline is claimed possible by the new Tru-Center gage. It is easily carried in the operator's pocket.

A machined aluminum body attaches itself to the cylindrical work piece with cylindrical precision locators which are magnetized by ceramic magnets inset in the body and in contact with the locators. If the work piece is of non-magnetic material, such as aluminum



Combination of counterweighting and anti-friction carriage mounting allows the wheel to follow the desired shape, as controlled by this template.



### SPEED AND FLEXIBILITY

#### — with cost-cutting Vertical Shapers

Easily set up and using the simplest tooling, the CHOMIENNE M-5" with its combination of longitudinal, transverse and rotary table movements, angular ram adjustment and ram speeds up to 270 strokes per min. solves production "problems."

Also available —

**Vertical Shaper, 12" with**  
**28½" Rotary Table, 5 HP motor.**

**Horizontal Shapers, plain and universal**  
**12" to 30" stroke, 2 to 10 HP motors**

**5" Vertical Shaper**  
**12½" Rotary Table**  
**2 HP motor**

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**74-G Mamaroneck Avenue**

**White Plains, New York**

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# Enco Turrets Assure ±.0005" Accuracy



by  
being  
on the  
ball!

Enco's passion for exacting accuracy is paying off in metal working operations everywhere! Combining precision lathe output with efficiency and economy has become a necessity . . . and Enco turrets have proved the ideal answer. An Enco turret transforms one lathe into a production machine, each operation of unsurpassed accuracy due to *spring loaded ball design!*



Spring loaded balls give you the accuracy you want! Hardened steel precision balls locked between accurately milled spherical seats consistently give accuracy in re-indexing. Hardened all steel construction minimizes wear, retains built in precision.

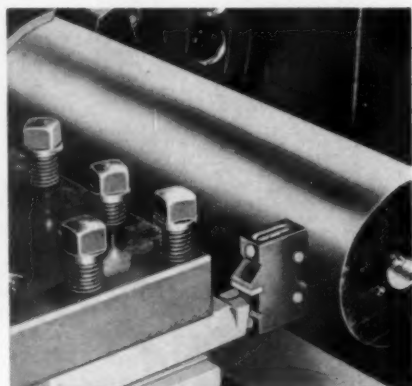
Also Mfrs. of Enco Hex turret Bed Turrets  
Write today for catalog No. 53.  
There's an ENCO turret for every lathe.

**Enco** MANUFACTURING CO.  
4520 West Fullerton Avenue  
Chicago 39, Illinois Dept. 260

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or brass, the gage may be held in place with a neoprene rubber band.

A spirit level is inset in both edges which enables the gage to be positioned to a degree of accuracy which can be measured in ten-thousandths of an inch.



This enables the lathe tool to be positioned either on the exact centerline or to a known amount above or below the centerline as desired.

There are two sizes offered which cover shop uses from the smallest automatic screw machine to the largest lathe.

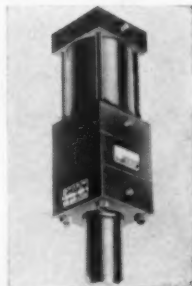
Tru-Center Products Co., P.O. Box 73L, Decatur, Ill.

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## Air-To-Oil Booster

S-P air-to-oil booster with integrally mounted tank is designed to boost ordinary air (80 psi) up to 3000 psi hydraulic pressure. No need of added power, pumps or motors.

The S-P Mfg. Co., 30201 Aurora Rd., Cleveland 39.



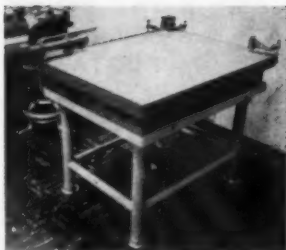
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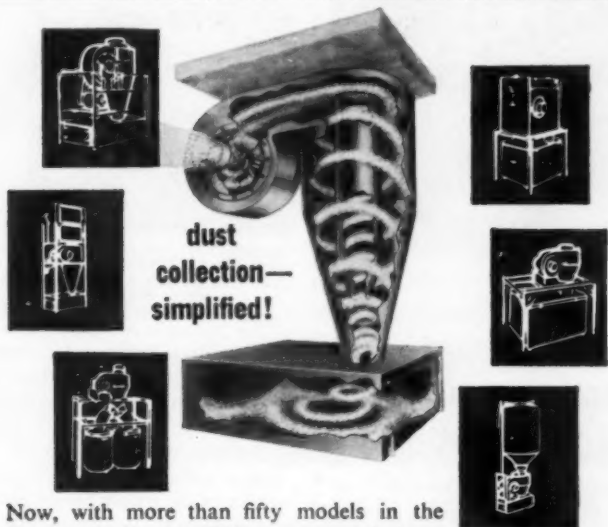
### "Extreme Tolerance" Surface Plates

A new line of "extreme tolerance" granite surface plates has been designed for operations involving ultra precision measurement to extremely close tolerances. An over-all surface tolerance guaranteed to .00001" is reported. Sizes range from 8"x12" to 30"x42" in no-ledge, two-ledge, and four-ledge styles. Threaded inserts can be provided for attaching special fixtures. The manufacturer states long life and dimensional stability is afforded by granite quartz construction.

Herman Stone Co., 1860 N. Gettysburg, Dayton 27.



Surface tolerance to .00001".  
Use postpaid card. Circle No. 68



Now, with more than fifty models in the Dustkop line—plus efficient accessory items—the odds are that a standard unit will solve your problem. Dustkop units solve other problems too. They're easier to install, save space and money and are virtually maintenance-free!

#### how to select a dust collector

This new brochure includes all basic information needed to select the right dust or mist collector for grinding, buffing, polishing and other types of service. Write for your copy. No obligation.



**AGET**

Manufacturing Company  
1402 Church St., Adrian, Michigan



**DUSTKOP STOPS DUST**

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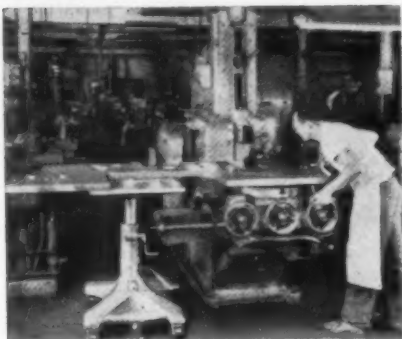
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PORTABLE

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*(Eliminates Cranking)*



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- ✓ Floor clamping available extra

Write today . . . specials on request

# MIDWEST

112 WEBSTER ST., DAYTON 2, OHIO  
Use postpaid card. Circle No. 365

222

## Precision Tool Room Jig Borer With Built-In Rotary Table



Conveniently located micrometer projectors offer quick, positive, and accurate settings, ideal for inspection or machining of parts in small and large quantity.

The Atlantic No. 6000 Series jig borer with built-in rotary table is reported to offer a quick method of positioning for longitudinal and cross motion within .0002", ideal for inspection or machining of parts in small quantity.

Conveniently located micrometer projectors offer quick, positive and accurate settings. Longitudinal and cross table movements are convenient from the operator's position. Feed and speed pre-selection are by means of push button.

Spindle speeds are featured in a low range gearing of 30 rpm to 250 rpm and in a high range of 270 rpm to 1500 rpm. Speed is infinitely variable, at any range by simply pushing a button. Electric clutches permit three distinct feeds per spindle revolution, .001, .003 and .006.

The machine is designed to withstand heavy duty milling, drilling, and boring to precision machining specifications.

MACHINE and TOOL BLUE BOOK

Uses include building of jigs, fixtures, molds, dies, gages, etc., in metals from aluminum to zinc.

Specifications include: table working surface, 20"x40"; table travel longitudinal, 35"; table travel cross, 18"; table top to spindle maximum, 25½";

table top to spindle minimum, 9½"; center of spindle to column way, 12"; spindle quill travel, 7", and spindle head travel, 10".

Atlantic Machine Tool Works, Inc.,  
549 Cedar St., Newington, Conn.

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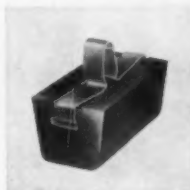


**DOUBLE END, FOUR FLUTE THRIFTMILL** is the latest addition to the Thriftmill line. As the others, it is ground from solid metallurgically tested high speed steel. The mill is designed for economical milling of over 80% of end milling operations. Six sizes are offered—1/8", 3/16", 1/4", 5/16", 3/8", 1/2". Cutting Tool Div., Brown & Sharpe Mfg. Co. Providence 1, R.I.

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**SELF-RETAINING RUBBER PARTS.** The Cooper Clip consists of a rubber extrusion and a metal clip. This clip positively retains the rubber, in addition to acting as a fastener for the entire unit. Applications have proven successful under static and dynamic loads. Of the varied styles offered, the C-2 tapered foot is shown. Cooper Tire & Rubber Co., Findlay, Ohio.

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Cuts up to  
2,000  
tubes per hour

## PAYS for ITSELF NO MATERIAL LOSS

### *Continental* **PIPE AND TUBE Rotary Cut-Off Machine**

It zips right through tubes from ¾" to 1¼" O.D., from light gauge to 16-gauge wall thicknesses. Adjustable table with Tri-Roller Assemblies and Manual Stock Loader. Also *Cut-Off Machines* up to 12" diam., air or hand-operated.

Machine Rental Plan

*Continental*

SINCE 1919

machine co.

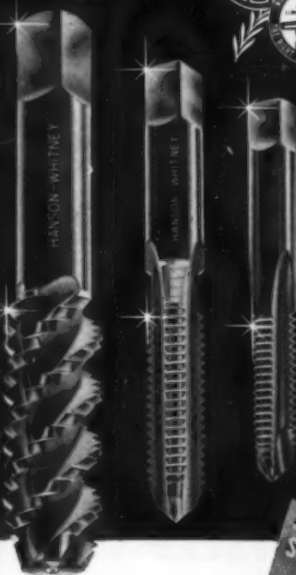
2345 W. NELSON ST.

CHICAGO 18, ILL.

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**DON'T PAMPER THESE TAPS**

*....they can take it!*



Hanson-Whitney has now standardized its line of Taps for "off-the-shelf" selection with all types and sizes measuring up to the most exacting requirements.

These Taps can be used at high speed operation on the difficult modern metals required in today's production.

H-W products are stocked by leading Distributors, with Technical Engineering Service readily available.

Write for the NEW Hanson-Whitney Tap Selector showing how to quickly make the proper tap selection. It's free!

**THE Hanson-Whitney COMPANY**

1269 BARTHOLOMEW AVENUE • HARTFORD 2, CONNECTICUT

TAPS • GAGES • COMPARATORS • HDBS • CUTTERS

**THE HANSON-WHITNEY COMPANY**  
1269 Bartholomew Avenue, Hartford, Connecticut

Please send me the new **TAP SELECTOR**.  
It's free.

Name \_\_\_\_\_ Title \_\_\_\_\_

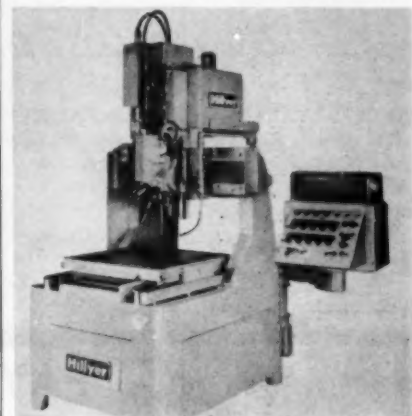
Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

## Machine Controls and Programs Drilling and Other Operations

Drilling, tapping, reaming, boring, and straight-line milling operations are fully controlled and programmed by the new line of Hillyer numerically controlled drilling machines. These machine tools permit spindle speed, feed rate and depth settings to be fully controlled by both tape and dial along with



Tape and dial control spindle speed, feed rate, and depth settings.

conventional x and y coordinates. Any combination of these three settings may be selected for any spindle at any time, permitting a given tool to be programmed to varying levels and varying depth of holes, all on the same work-piece.

Jigs and fixtures are completely eliminated. Accuracy and speed of operations are greatly improved, the manufacturer also states, with holes located and drilled to accuracies of .001" per foot.

The dial control panel and tape reader are mounted integrally with the machine. Tape preparation is simple and speedy.

Hillyer Corp., 331 Centennial Ave., Cranford, N.J.

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217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232
233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248
249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264
265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296
297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312
313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328
329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344
345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376
377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392
393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408
409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424
425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440
441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456
457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472
473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488
489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504
505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520
521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536
537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552

Inside Front Cover    Inside Back Cover    Back Cover

### EDITORIAL ITEMS

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200

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*A Hitchcock Publication*

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### Metal Insert Added to Tip Of Safe-T-Grip Hammer

Changes reported for the Safe-T-Grip hammer include addition of a metal insert to the tip and burnishing the handle until it resembles chrome. The manufacturer's guarantee covers stripping threads in the tips and on the stud, and breakage of the handle. Even wear is obtained on the tips by loosening, then rotating the worn spot. Finger grips on the handle are a safety feature.

R. W. Hughes Industries, Inc., 2713 Ludelle, Fort Worth, Texas.



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## The WELLS Model 600 Metal Cutting Band Saw

for  
Tool and  
Stock Room  
Service

for  
Medium  
Production  
Jobs



Wet Cutting  
System Optional

Rugged in design, dependable in operation, the Wells Model 600 is the ideal saw for tool and stock rooms . . . gives excellent service on medium production jobs. Uses  $\frac{5}{8}$ " blade. Adjustable, uniform gravity feed is provided by hydraulic stabilizer and special coil spring. Casters available for portability. Write for Bulletin 260-A.



*The Pioneers of Horizontal*

**METAL CUTTING  
BAND SAWS**

WELLS MANUFACTURING CORPORATION  
707 Coolidge Ave., Three Rivers, Mich.

Use postpaid card. Circle No. 367

### Do-It-Yourself Work Holder

A new "Erect-Your-Own" work holder has been introduced for use in light production such as assembly of electronic, aircraft, and office equipment components. It may be put to-



gether in any shape to suit any sized workpiece.

The work holder may be used with the Wilton PowRarm or bolted to work table or bench. The unit is available as a complete kit or in individual components.

The kit, No. 391, contains two 18"

perforated strips of 1/4" aluminum plate, three 90° connecting angles of the same material, two toggle clamps, and a dozen screws and nuts. Perforations measure 1/4". Any of these parts may be purchased individually.

Wilton Tool Manufacturing Co. Inc., Schiller Park, Ill.

Use postpaid card. Circle No. 73

### Cutting Grade Provides For Surface Finishes to 12 RMS

Kennametal cutting grade K165, engineered for high velocity precision machining, is said to provide for exceptional high hardness-strength for machining high temperature alloys of low machinability.

It is also claimed the cutting grade possesses greater combined crater and edgewear resistance than conventional tungsten carbide cutting tool materials.

Surface finishes as low as 12 rms and better are produced, frequently eliminating expensive grinding operations.

Kennametal Inc., Latrobe, Pa.

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## PRODUCTION SHORT-CUT IDEA



An all-new TEMCO electric furnace specifically designed to let you heat-treat more and bigger parts in a bench-type unit. Larger chamber size . . . 10" W, 9 1/2" H, 22" D. Higher temperature range . . . continuous up to 2000° and 2300°F (1095° and 1260° C) . . . handles most high-speed steels.

This new Type 1800 TEMCO furnace features a close-sealing sectional door with patented lever suspension to provide limited or full access as desired. Reinforced welded steel case . . . 7 1/2" firebrick and backup insulation. Choice of single or three-phase models, for 208, 230 or 460 volts. Available with or without controls. \$685 to \$745 furnace only.

Write for free literature and name of nearest dealer.



### ELECTRIC FURNACES

Thermo Electric Mfg. Co.

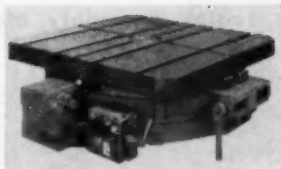
486 Huff Street, Dubuque, Iowa

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### Rotary Tables Index Off-Center Loads

New Airmist rotary tables will index extra-heavy loads, even when placed off-center, the manufacturer reports. A special valve design prevents the air-oil mist from spilling out the light side of the table. Tables are available in sizes starting at 36" round or square; special sizes on order. The tables may be used with horizontal boring mills and milling planers. Tables are also furnished on runways for use with floor type horizontal boring mills.

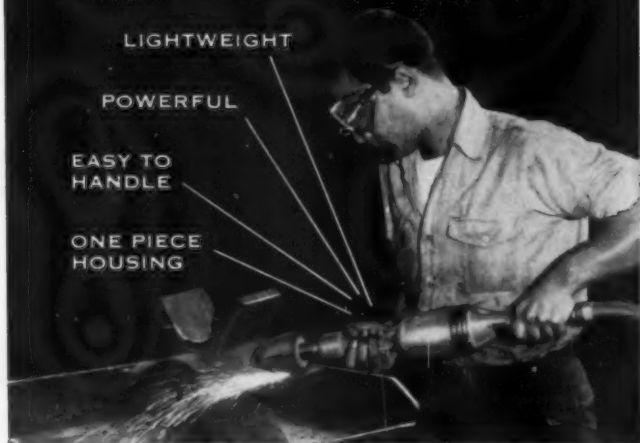
The Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.



Sizes start at 36" round or square.

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## WILSON Pneumatic Horizontal Grinders



### Faster grinding...less operator fatigue

Wilson's new Horizontal Grinders speed grinding, buffing, wire wheel work and many other metal removing and finishing operations. Available in various sizes and models, with speeds ranging from 3100 to 12,000 r.p.m. Write for Catalog PT-58.

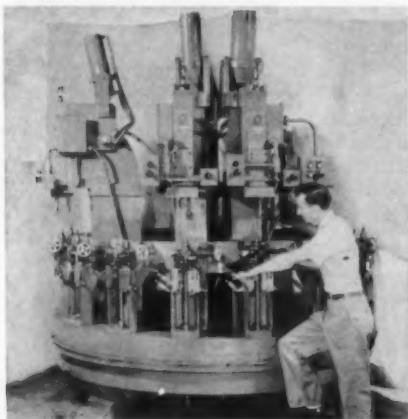
TW903

**THOMAS C. WILSON, INC.**

21-11 44th Avenue, Long Island City 1, New York

**BETTER TOOLS FOR BETTER WORK**

## Circular Assembly Machine



The PDC circular assembly machine makes it possible to have heads, hop-

pers, panels, also air and electric supply, in the center of the machine, leaving outer circumference as work area.

The entire machine diameter is open and accessible for safety, loading, and maintenance.

Smooth, fast mechanical drive is offered with choice of standard rotary type air motor, fluid type motor or electric motor.

Machine assembles motors, pumps, transmissions, or any assembly requiring a combination of hand-loaded parts and automatically hopper-fed parts.

Precision Detroit Co., 20100 Sherwood, Detroit, Mich.

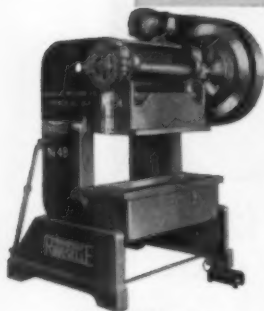
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## Elevating Feeders

This line is designed for feeding and orienting parts of a variety of sizes, shapes, and materials to processing or

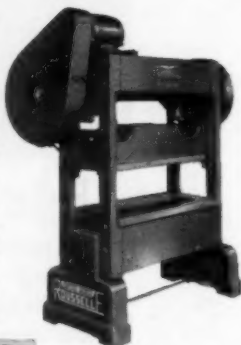
# High-Output with **ROUSSELLE**

## DOUBLE-CRANK PRESSES



No. 48 OBI with "Econo-Air" clutch.

**SPEED UP PRODUCTION** with these versatile 40-ton presses. Large bed and ram areas make them ideally suited to handle wide rolls or sheets . . . do multiple punching, steel-rule die work and other high output operations. For rapid, shockless starting and stopping, presses can be equipped with electrically controlled "Econo-Air" friction clutch . . . Ask for new catalog.



Choice of over 30 models and types in 5 to 60-ton sizes



**STRAIGHT SIDE** - Die space up to 24 in.; bed space up to 6 ft. between uprights.

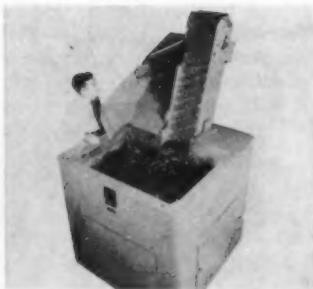
## SERVICE MACHINE COMPANY

Mfrs. of Rousselle Presses

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Rousselle Presses are sold exclusively through Leading Machinery Dealers.



assembly machinery. It can effect discharge to the right or left at desired heights.

The drive is either fixed or variable speed and can be equipped with automatic controls for "demand feeding," feeder operating only when parts are needed.

Standard sizes of 6, 12 and 20 cu. ft. holding capacity are offered.

Detroit Power Screwdriver Co., 2801 W. Fort St., Detroit 16, Mich.

Use postpaid card. Circle No. 77

## how to trap dust

*that damages  
your machines  
and hurts  
company morale*

Easy-to-move

**TORIT**

dust collectors trap dust  
at its source!



Untrapped dust costs money: "secretly" forces precision machines out of line, limits production. Torit dust collectors are unitized for custom installation—save more money, usually more efficient than central (built-into-building) system. Torit unit operates only when machine or combination of machines it protects are on. Filtered air may be returned to room to save heat. Many models and sizes, all self-contained, easy to move. Write today to . . . Dept. 601.

**TORIT**  
*manufacturing co.*

1133 Rankin Street, St. Paul 18, Minn.

### Miniature Cutting Tools

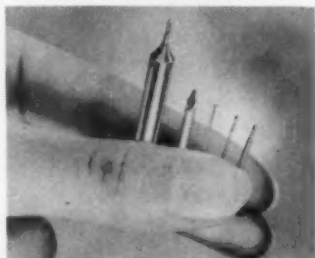
Five different high-speed steel cutting tools are displayed between a girl's thumb and forefinger. From left to right, they are: a two-flute, single-end end mill; a radial type center drill; a straight-shank, straight-fluted, wire gage size chucking reamer; a micro twist drill, and a spiral pivot micro twist drill.

The twist drills are available in millimeter sizes, .15 mm. (.0059") through .50 mm. (.0197") in both right- and left-hand cut. Pivot drill sizes range from .10 mm. (.0039") through .40 mm. (.0157"). All pivot drills have 1.00 mm. (.0394") diameter shanks.

Center drills (combined drill and countersink) are now standard with the company in sizes 00 and 0. The 00 size has a .025" drill dia. and 5/64" body dia. The 0 size has a 1/32" drill dia. and 1/8" body diameter.

Straight-shank, straight-fluted reamers are now also a regular stock item in wire gage sizes 61 through 80 and

in two fractional sizes, 1/64" and 1/32". Tolerance is +.0002, -.0000. These reamers have two or three flutes depending on the particular size involved. A full set of 20 reamers, sizes 61-80,



is also available in a metal container.

Miniature end mills are standard in 11 different styles—a total of 77 sizes. Size range is from 1/32" through 3/16" by 64ths. Style selection in single-end, double-end and ball-end all have 3/16" shanks. They are ground from the solid and have radial back-off.

The DoAll Co., Des Plaines, Ill.

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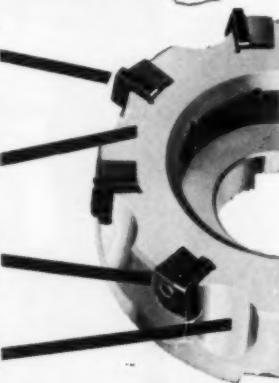
## More Milling Possible . . . Milling More Profitable With FUTURMILL *and a handful of carbide blades*

**1. Lower cost metal removal.** Futurmill takes the burden out of milling with inexpensive indexable carbide blades. No need to remove the cutter from the machine . . . no more cutter grinding and no more delays and lost production time. Index a Futurmill quickly and accurately, right on the machine.

**2. Plenty of muscle for any job.** The cutter body is a solid one piece construction of heat treated alloy steel . . . not only the most rigid cutter built . . . but precision built.

**3. Protection for the cutter body.** The case hardened wedges behind the blades absorb the damage in case of an accident and save the cutter body . . . cutting down expense and lost production time for cutter repair or replacement.

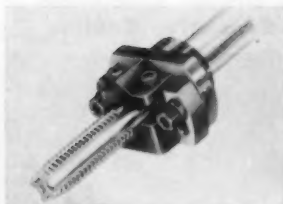
**4. Unobstructed chip clearance.** Huge chip pockets in front of the blades direct the chips out and away from the cut—critical on steel applications and on deep cuts.



**FUTURMILL, INC.** / 6360 Highland Road • Pontiac, Michigan

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Eliminates bushings.

Use postpaid card. Circle No. 79

### Non-Releasing Tap Holder

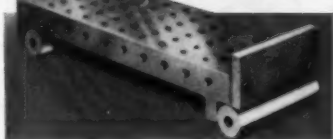
A new V-jaw tap holder is said to permit faster, easier screw machine set-ups while eliminating bushings and reducing tool inventory. Accommodating either extended or close-held taps, the new slip-in holder is reported to offer automatic, axially-perfect tool alignment. It also eliminates cutting off tap shanks. Locking assembly of the holder keeps tap held securely. Due to the adjustable V-jaw, each tap holder unit services a wide range of tap sizes; special shanks available.

Brookfield, Inc., Stoughton, Mass.

### FOR PRECISE ANGLE SETTING



### ... USE TAFT-PEIRCE SINE BLOCKS



Use Taft-Peirce Sine Blocks to set work to precise angles for layout, light machining, and inspection. No angular scale to read — just elevate the sine block to the desired angle by placing gage blocks under one roll.

Available in 5", 10", and 20" sizes, each with end stop and tapped holes for applying work clamps. For information, including set-up instructions and setting constants, ask for Catalog 511.

**TAKE IT TO TAFT-PEIRCE**



7 MECHANIC AVENUE, WOONSOCKET, RHODE ISLAND

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*Toughest, hardest, strongest  
... none finer at any price!*



*It pays to specify*

# ACE

**DRILLS  
REAMERS  
BLANKS**

Premium Quality High Speed Steel  
Carbide Tipped and Solid Carbide

Call your local distributor today—or write Ace  
direct for latest catalog and price information.

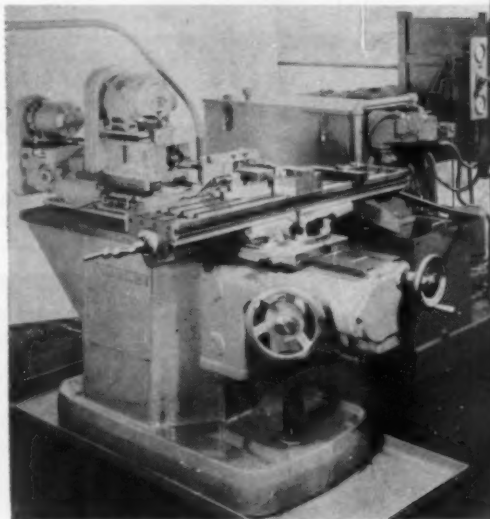


**ACE DRILL**  
Adrian, Michigan

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

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## Deep Hole Driller Eliminates Need For Expensive Tooling



$\frac{1}{8}$ " to 1" cap., 12" or 24" feed stroke.

A new deep hole drilling machine, revolving drill type, uses the built-in advantages of rapid work-positioning and simplified tooling possible with knee type construction. This machine eliminates the need for expensive and cumbersome fixtures normally required for accurate location of holes.

Capacities are provided from  $\frac{1}{8}$ " to 1" with a 12" or 24" feed stroke; spindle speeds and feed rates suitable for a wide range of work, and rapid advance and return. Other advantages the manufacturer points out include vertical and longitudinal positioning with calibrated handwheel and crank to one-thousandths of an inch; 28" longitudinal, 12" transverse and 12" vertical travel, and a high pressure coolant unit.

The zero setting gage permits speedy, accurate location of the table and work-holding device in relation to the axis of the drill spindle.

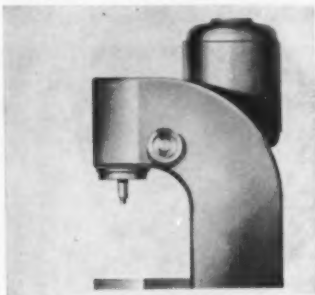
Optional, extra-cost equipment and special fixturing and accessories are also available.

Brown & Sharpe Mfg. Co., Providence 1.

Use postpaid card. Circle No. 80

### Portable Press Has Unlimited Throat Dimension

The E.J.S. portable press has a 4" stroke, 1" ram, and 5½" throat. Pressure range is 50 to 1500 lb. Weighing 150 lb., press is complete with built-in



hydraulic power unit and ¾ hp motor. It plugs into any convenient 110 volt, 60 cycle current outlet; other electrical ratings available.

For high production applications, it is provided with automatic control features to synchronize with any machine tool or production line. Press is also available with hand lever, push button or foot controls.

To provide unlimited throat dimension, the press is supplied without base.

Ideal for small assembly work and fabricating jobs.

John S. Barnes Corp., 315 South Madison St., Rockford, Ill.

Use postpaid card. Circle No. 81

### Solenoid Valve



This Norgren Series A packless solenoid valve is two-way normally closed for ⅛" and ¼" pipe. Featured is flow control. The valve is designed for use with air, water, oils, and gases.

C. A. Norgren Co., 3400 S. Elati St., Englewood, Colo.

Use postpaid card. Circle No. 82

June, 1960

# Cooley

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## HEAT TREATING

## FURNACES

41 Models—with and without

*Controlled Atmosphere*

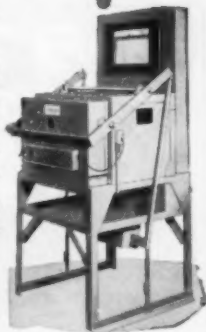
### RECIRCULATING OVENS

for drying, baking, etc. 3 Types—650° F., 850° F., and 1000° F. Wide range of sizes.



### INDUSTRIAL BOX FURNACE

for general heat treating to 2000° F. Highly efficient with low maintenance; quick repair with small down time; sturdy; reliable.



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- New GA Atmosphere Box Furnace
- Recirculating Air Draw
- Bench Types
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## Fisher Benders



A simple, sturdy machine designed to do its work in the easiest way, this bender is made of best quality malleable iron castings and has a hardened steel bending blade.

Capacity: 7/16" square or round iron

2" x 1/4" channel iron

2-1/4" x 5/16" flat iron

Catalog sheets on complete line of metalworking tools and accessories available.

**T. H. LEWTHWAITE MACHINE CO.**

312 East 47th St.

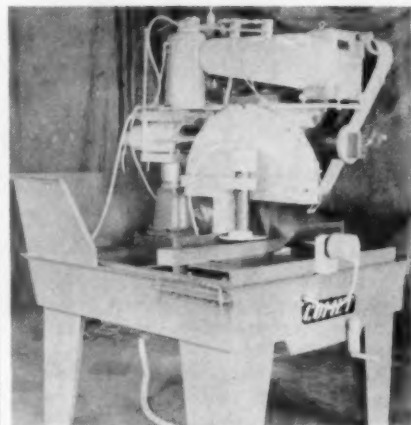
New York 17, N.Y.

Use postpaid card. Circle No. 377

## Metal Cut-Off Saw

Comet Model MF metal cut-off saw shown is powered by a 10 hp, 3 phase, 220 volt motor, belted to a four gear transmission. Its application is to cut non-ferrous tubing for a Los Angeles tube sales company.

The saw is operated by a four-way foot control valve which releases the hydraulic pneumatic feed system and



Unit is shown cutting barstock. This is cut at the rate up to 2 1/2" per second, leaving a micro finish of approximately 80.

closes the vises, actuates the saw on the rigid arm in a forward motion and upon the release of the foot valve, returns the saw to the starting position and releases the vises. The quality of the cuts depends on the geometry of the blade and the rate of feed which is adjustable.

The model can also be adapted with abrasive wheels for cutting steels and some of the exotic metals, such as Inconel.

This unit is equipped with a Norgen spray mist system and can be also equipped with a flow coolant system depending upon the needs of the customer.

Other units manufactured are currently being used in aircraft, sub-contractors, machine shops, and are holding tolerances reported as  $\pm .002$

and ten minutes on the angle. The quality of the cut is in direct ratio to the speed of the feed and the type of blade used on the machine. Units are equipped usually with a 12" or 14" blade. The requirements of the user determine the specifications.

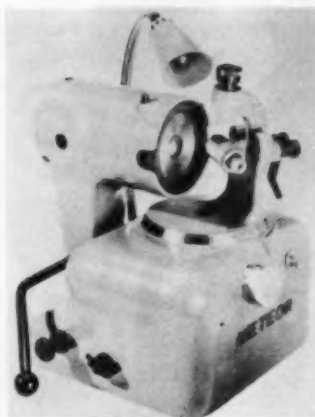
Comet Mfg. Co., 2033 Santa Fe Ave., Los Angeles 21, Calif.

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### Grinder Accepts Drills 6¼" Long, .236" in Dia.

The new Swiss-made KBS-6 Meteor twist drill grinding machine was designed for sharpening milling cutters and right- and left-hand twist drills from .008" to .236" in diameter and up to 6¼" long. Models for larger drills are also available. The easily-operated unit measures 13" x 10" x 15½" and weighs only 37½ lb.

Standard equipment includes a 20-power magnifying glass, a dressing diamond adjustable side stop for flat drill grinding, grinding ring, and lamp. Op-



tional accessories include special collets for sharpening center drills up to 7/16" in diameter and diamond grinding wheels for sharpening carbide tools.

Price is \$486.50 f.o.b. N.Y.

Associated American Winding Machinery, Inc., 750 St. Ann's Ave., N.Y. 56.

Use postpaid card. Circle No. 84



MODEL "D" 1960

## NEW FOR 1960

- NEW Improved Design
- Increased Durability
- 1" Shorter Over-All Height
- Full Adjustment for Wear

**A Boring Head That Won't Face — is Obsolete**

Boring, Facing, Grooving, Turning, All in One Toolhead—"As it should be."

- SIX SIZES AVAILABLE •

For complete details, write to:  
**CHANDLER TOOL CO. • Muncie, Ind.**

# Chandler-Duplex

COMBINED BORING AND FACING TOOLHEADS

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### Air Staker Combines Arbor Press, Staking Functions



Fast assembly of small components.

Basically an arbor press with a staking feature, the new Cramer air

staker performs pressing or staking operations independently, or combines them in rapid sequence. The result reported is faster, lower-cost assembly of small components such as cams, bushings, gears, shafts, posts and plates.

Die-set accuracy is achieved because fit of the tools is within .001 and the platen is machined square to the work line. Staking is accomplished by the impact of a tool steel piston rod inside the arbor press ram, which serves as an air cylinder.

Force of the staking blow is adjustable by a pressure regulator on the air valve, from 15 psi to line pressure.

Operator fatigue is eliminated in heavy pressing operations where considerable force would be required on the arbor press lever. Pressing is done with a hand lever.

Cramer Controls Corp., Centerbrook, Connecticut.

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## TESTS *with* CLOVER LAPPING COMPOUND

Machine lapping is always important—no one uses the process unless it is. And, as makers of the first commercial abrasive compound, Clover knows that the kind of lapping compound you use can make a vast difference in efficiency as well as in finish.

Only testing can prove out the best combination of lap speed, grain, vehicle and pressure. But one thing is sure: you might as well have Clover's 50 years of tests behind you when you start your own.

Check with Clover on lapping and grinding problems. The hardest lapping jobs often respond to an answer that was worked out for something entirely different. Use Clover's experience for a starter—write for suggestions and samples.

## Clover Manufacturing Company

*Norwalk, Connecticut*

Victor 7-4515

*We also make* **CLOVER COATED ABRASIVES**

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### Cut-Off Saw Permits .003" Tolerances

Navkut saw is said to permit .003" tolerances to be held by an unskilled operator. Alignment of blade and spindle is held to .001" tolerance in all planes. The manufacturer also states ferrous and non-ferrous metals, plastics, and wood are cut with excellent finish and minimum burr, making the saw an ideal cut-off tool for small shops. Larger shops use it as auxiliary for job work to save breaking into production runs on automatics. Priced below \$300.

Navan Products, Inc., 900 N. Sepulveda, El Segundo, Calif.



Saw's spindle and vise are integral parts of the same casting.

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## CAPACITY (AT LOW COST) MAGNETIC BASE RADIAL DRILL PRESS

YET COMPLETELY PORTABLE!

### SAVES ON

- MAN HOURS
- SET UP TIME
- MATERIAL HANDLING

Adaptable to all makes of drills—air and electric

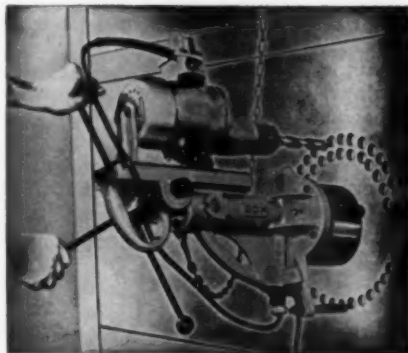
Simple, rugged construction—designed for many years of trouble-free service

Versatile—its compact size makes it suitable for many different applications

Reaming and tapping time and costs can be slashed with the new BUX

**OPERATES IN ANY  
POSITION WITH NEW  
RADIAL POSITIONER** ►

does the job of a \$16,000 Radial Drill!



**BUX**

magnetic products

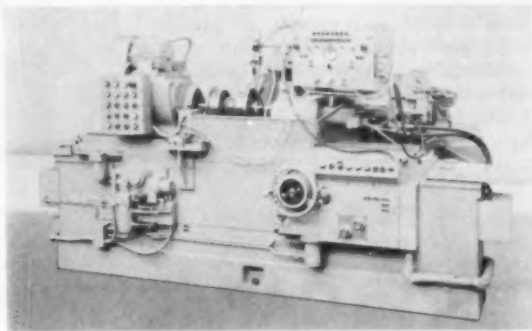
**BUCK MFG. CO.**

1355 NORTH TENTH STREET

SAN JOSE, CALIFORNIA

Use postpaid card. Circle No. 380

## Grinder Combines O.D. and Shoulder Grinding In Automatic Cycle



Angular wheel slide grinder combines O.D. and shoulder grinding for extreme accuracy and excellent finish required for oil seal and thrust bearing seats.

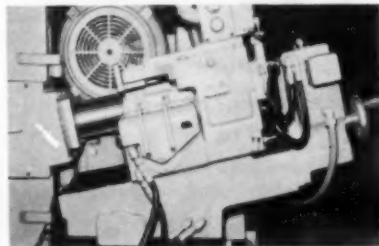
The new Cincinnati Filmatic semi-automatic angular wheel slide grinding machines, built in 6"R and 10"L, and 10"R and 14"L sizes, are designed to combine O.D. and shoulder grinding in a single, fast, automatic cycle. Typical applications include crankshafts, steering knuckles, gear blanks with hubs, etc., with critical flanges, tapers, and shoulders. Built to feed at either 30° or 45°, these machines are reported to make it easy to obtain a superior circular line finish instead of a criss-cross finish.

Automatic behind-the-wheel profile truing provides fast, accurate grinding wheel truing with provisions for two to ten passes with or without diamond advance on the last pass. The manufacturer also states it may be set to true after a predetermined number of pieces have been ground.

Standard features reported include automatic grinding wheel balancing, equipping with self-adjusting Filmatic bearings, and hydraulic motor drive of infeed screw, which provides sizing adjustments as fine as .00005" on work diameter.

Operator convenience is a feature with the automatic infeed cycle. When the grinder is set for automatic operation, pressing wheelhead advance but-

ton initiates an automatic cycle that hydraulically clamps the table, rapidly advances the wheelhead, starts work rotation, grinds at fast feed rate, grinds



Behind-the-wheel profile truing provides automatic, accurate, cam-controlled, grinding wheel truing.

at slow feed rate, carries, rapidly returns the wheelhead, stops work rotation, and unclamps table.

Optional equipment includes the automatic air-electric gage sizing with a cycle time stabilizer, also an automatic gap eliminator.

Cincinnati Milling's Grinding Machine Division, Cincinnati 9.

Use postpaid card. Circle No. 87

### High-Speed Precision Lathe Features One-Motion Control

The 60 Series high-speed precision lathe features "one-motion control." The use of a single lever reduces spin-

WRITE *Peaslee* FOR  
PRECISION  
PRODUCTION RUNS OF




## TAPER PINS

DIAS. 9/0 to #4

As specialists in stainless-steel, instrument-type pins, we offer quantity runs of standard size Taper Pins. Tolerances are held to .001 on dia. Sizes run from #4 down to 9/0. Send your blueprints for prompt quotation.

**THE PEASLEE METAL PRODUCTS INC.**  
470 Tolland St. • East Hartford 8, Conn.  
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save 20 to 30% on new  
**CARBIDE TOOLS**

**RICO** has a complete line of:

- Quality rotary carbide & HSS tools
- Available for immediate delivery
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- Special tools to specifications
- Distributor inquiries invited about better profit margins with **RICO TOOLS**.



Attach ad to your letterhead for more information.

**RICO TOOL CO.**

5915 DIXIE HWY. • SAGINAW, MICH.

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June, 1960

## WILSON AIR COLLET CLOSER



**STEP UP PRODUCTION 20% +**  
... for most lathes to 1"  
bar stock capacity

- Hold delicate parts without damage or adjustment
- Iron grip for heavy work
- No adjusting for stock or part variations
- Finger-tip or foot control eliminates operator fatigue
- Eliminates jarring of head stock

(Ten day **FREE TRIAL** to reliable firms)

**WILSON AIR COLLET CLOSER, INC.**  
909 40th Ave. NE, Minneapolis 21, Minn.

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**DEKA-BORE**  
**OFFSET BORING HEADS**

UNPARALLELED

- ACCURACY
- RIGIDITY
- SIMPLICITY
- DURABILITY

REPEAT TO .0001"  
IN 30 SECONDS  
WITHOUT BACKLASH!  
CAN BE ADAPTED  
TO FIT ANY  
MACHINE

100% GUARANTEED! WRITE FOR CATALOG!

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PRECISION TOOL & MFG. CO. 61 ILLINOIS  
1305 SOUTH LARAMIE AVE., CICERO 50, ILL.

MTBB-60

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dle control time and increases productive time. This lever starts spindle and selects any speed within a range up to 4800 rpm. It changes speeds, stops or reverses spindle. Stops may be set for repeating selected speeds on duplicate work.

The double-bevel bed positively cen-



ters tailstock in alignment with headstock. Dovetail aligns compound slide rest and evenly distributes its bearing on top of bedway as tool pressure pulls against inverted dovetail.

Large diameter super-precision ball

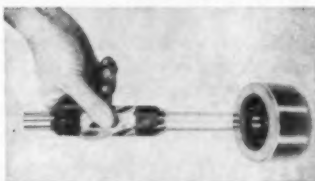
bearings fitted to in-line ground mountings are said to assure spindle true roundness and rigidity. Constant bearing preload, unchanged by speed or heat, holds spindle rigid against both side and end pressure of cutting tool.

Contrasting black markings on white dials record feed of cross slide "on diameter" and feed of compound slide in direct linear motion.

Rivett, Inc., Brighton 35, Boston.

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### Superior Wearing Qualities Claimed For Ceramic Gages



Note the steel pilots which are recommended (at no extra cost) to guard against possibility of chipping ends of plug gage members.

**JAM PROOF**

**AUTOMATIC THRUST ADJUSTMENT**  
Spring loaded spindle maintains constant tail stock thrust.

**LONGER LIFE**  
Needle bearing distributes bearing stress over greater surface, thus holding close tolerances for much longer time.

**FASTER SPEEDS**  
Smaller turning radius gives much higher RPM rate than ordinary live centers.

# CONCENTRIC

**LIVE CENTERS**

the original, patented  
spring loaded live centers

**GREATER LOAD CAPACITY**

**LESS OVERHANG MEANS MORE RIGIDITY... MORE WORKING RANGE**

Write Today for Complete Information

CONVENTIONAL LIVE CENTER

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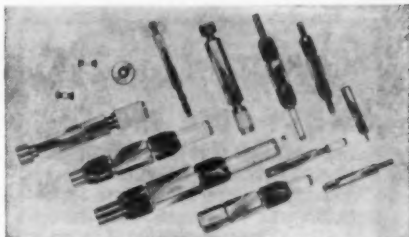
Pat No. 2,520,473

**CONCENTRIC TOOL CORP., 2486 Huntington Dr., San Marino, Calif.**

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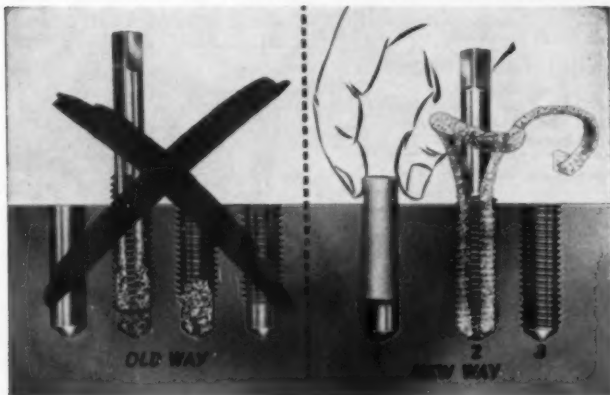
The manufacturer uses a special type of ceramic for his plain and threaded plugs and plain ring gages. It is known as high density, high purity aluminum oxide, and was chosen to give the maximum possible strength and surface finish.

Gaging with ceramic gages is said to offer no problems different from gaging with conventional steel gages, except that they are more brittle and need careful handling. Otherwise, the major



Thread plug, plain plug, and plain ring ceramic gages.

## Chip problems eliminated when you tap blind holes with new **TAP CARTRIDGES**



Pictured on right shows (1) a tap cartridge (wax pellet) dropped into drilled hole. As tap works into hole (2) solid flow of wax carries chips along and out flutes as fast as chips are made. Bottom of hole is clean when taps get there. Result (3) a clean accurate hole.

- Tap to bottom of hole in one pass.
- Tap cleans itself on next hole.
- Eliminates rejects, torn threads, oversized holes.
- Extends tap life 3 to 5 times.
- No allowance for chip room.
- Obtain a smoother, more uniform thread.
- Can be used in steel, iron, aluminum, plastic and the newer exotic metals.

For **FREE SAMPLES** give tap size, threads per inch, depth of drilled hole. Sizes 0-80 thru 1 1/4". Write or phone today.

**THE TAP CARTRIDGE CO. P. O. BOX 1017-T**  
JUniper 1-7511 • **CINCINNATI 1, OHIO**

## NEW *Baj* ONE-PASS KEYWAY PUSH BROACH



This non-adjustable version of the Glenny Adjustable Expansion Broach (formerly produced by the East Shore Machine Co., Cleveland, Ohio) introduces these outstanding features:

- FAST, EASY OPERATION
- REPLACEABLE HIGH SPEED STEEL CUTTING BLADE
- EXCLUSIVE BODY DESIGN
- HIGH ACCURACY—to .0005 plus or minus
- LONG LIFE—up to 100,000 keyways without replacing.
- WIDE RANGE OF STANDARD SIZES

Write for Details, Exclusive Distributor Territories Open.

### The Baj Tool Company

(Manufacturers of  
Baj and Glenny Broaches)  
19751 St. Clair Avenue  
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## A CONTROLLED BLOW Saves TIME, EFFORT and MONEY

### TAHLEN NO-BOUNCE HAMMERS

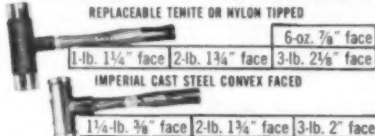
Supply your machinists with  
TAHLEN NO-BOUNCE HAMMERS

Prove, in your own plant, why this imitated, but never equalled hammer has saved millions of man-hours for its users. Plastic tipped TAHLENS have all the advantages of lead hammers but none of their faults. No flying fragments, no distorted faces that cause misplaced blows.

And for fastening and drilling, Cast Steel TAHLENS with their high impact, replace mauls twice as heavy—save time and energy.

### CONTROLLED BLOW PROFITS are yours with TAHLENS

REPLACEABLE TENITE OR NYLON TIPPED



Write for the Tahlen distributor in your area  
Dept. M6 **TAHLEN HAMMER CO.**  
1729 1st South, Seattle 4, Washington

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advantage reported is that they are superior in wearing qualities to either steels or carbides.

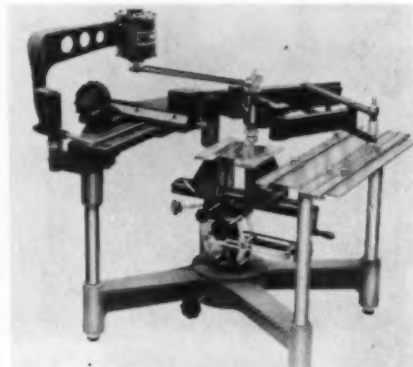
In addition, the company states advantageous comparisons are shown in high abrasion resistance, low coefficient of friction, and non-corrosive and non-magnetic properties.

Types available include thread plug gages, No. 6 through 1 1/2"; plain plug gages, .100 through 1 1/2"; plain ring gages, .070 through 1 1/2", and plain master discs, .105 through 1 1/2". Sizes smaller or larger, and specials, upon order.

Greenfield Tap & Die Corp., Greenfield, Mass.

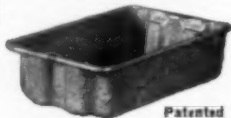
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## Table Model Engraving Machine Cuts 1/16" In Cold Rolled Steel



Engravograph Model ITX produces precision work with unskilled labor

## FIBERGLASS TOTE PANS



Patented  
2,823,828  
2,823,829

Molded in one-piece  
Stack-n-Nest® without gadgets. Stacked payloads up to 3000 lbs. static load. Rust-proof—Dentproof—8-sizes—3-colors. Ship-ment from stock. Write for Catalog.

### G. B. LEWIS COMPANY

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MACHINE and TOOL BLUE BOOK



from a master template, because of its tracer-guided feature. Stating that it features far heavier construction than previous table type engravers, the firm reports it does two kinds of jobs. As a marking tool, it makes signs and nameplates, engraves names and numbers on parts, tools, etc. As a production tool, it saves man hours and costs by doing jobs requiring slotting, profiling, and milling.

Some of the features reported are that the machine cuts 1/16" deep into cold rolled steel in one pass; 1/8" in non-ferrous metals; covers a 12" x 3 1/2" area in one set-up, and offers 21 different ratio settings ranging from 2:1 to 7:1. Settings can be changed in seconds without dis-assembly of any kind.

New Hermes Engraving Machine Corp., 154 W. 14th St., New York 11.

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**Up To**  
**10,000 psi Oil**  
**from**  
**Shop Air!**



**AIR TO  
HYDRAULIC**

**BOOSTERS**

**No Pumps or High Pressure  
Valving Needed**

Hook a Miller Air-Hydraulic Booster to your air line and get INTENSIFIED (ratios up to 100 to 1) Hydraulic Power that you can vary and control at will and use for such common shop operations as punching, clamping, pressing, riveting, shearing, welding, crimping, testing, etc. High pressure booster output drives the hydraulic work cylinders and can be directly applied (without cylinders) in testing, measuring, other applications. Boosters save air, space, weight, require little or no maintenance, and hold pressure as long as desired without additional power consumption. Models for immediate delivery.



**Model 77  
Shown**

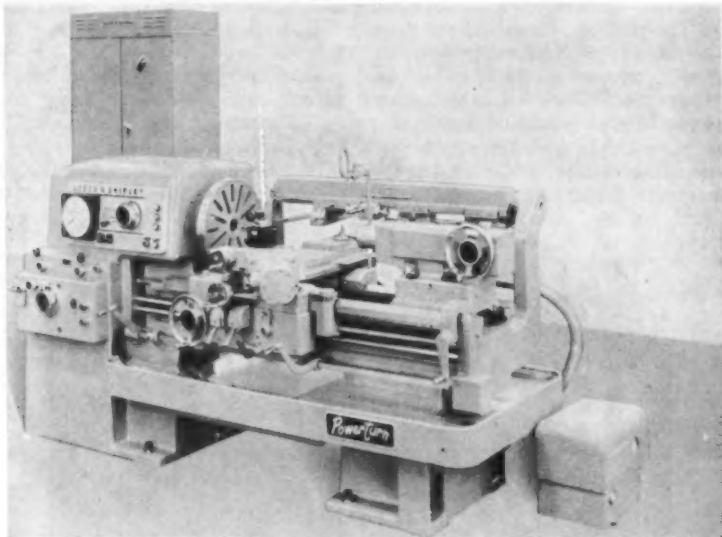


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Full Details**



**FLUID POWER DIVISION**  
 Hick Reedy Corp.  
 7N022 York Road Bensenville, Ill.

## Constant Cutting Speed Lathe



2013 Powerturn 45° Copymatic lathe (30" between centers). Unit at right end of lathe is Copymatic hydraulic system reservoir, filter, pump, and motor unit. Cabinet behind left end of lathe is variable speed control for DC drive motor. This lathe also is equipped with special cross slide extension for cross-center facing and automatic reversing controls for spindle and feed.

A new universal constant cutting speed lathe that eliminates the need for speed control cams and computations has been announced. Built in Powerturn 45° Copymatic models in sizes from 2013 to 3220-37, the new lathe provides constant cutting speed at any point, regardless of contours. The manufacturer also states that the machine eliminates the cost and delay of providing a special speed control cam for each job, gives longer tool life and minimizes tool grinding.

The lathe headstock is equipped with a 24-speed transmission plus a variable speed drive which permits infinitely variable control of each speed, with automatic and/or manual speed control. Even in automatic operation, the operator can, through a conveniently-mounted dial, manually "trim" the spindle speed.

This machine, with an operation tech-

nique Lodge & Shipley calls "combined feeds," is said to make possible machining capacities substantially greater than on conventional tracer lathes. As a typical example, a 26" diameter hemisphere, machined by conventional tracing, would require 18- $\frac{7}{2}$ " of cylinder stroke, which is impractical. This is unnecessary, it is stated, for "combined feeds" engages longitudinal and cross feed simultaneously to give a straight tool path in a line which might be termed a "mean" of the contour. Then, the hydraulic cylinder needs to provide only for the differences from this path to the actual contour being machined.

Elaborating on "combined feeds," Lodge & Shipley points out that conventional cross feed and longitudinal feed (in a 1:1 ratio) gives a tool path at 45° to the centerline. In extreme cases, longitudinal and cross feed ratio

It's SENSATIONAL!

**Rapid Tap**

CUTTING FLUID

licks those

**STAINLESS**  
CUTTING PROBLEMS

Amazing but true! A drop or two of this fluid instantly releases stuck tools... lets you tap, ream, drill and thread hard-to-cut stainless steels with ease and speed!

**RELTON**  
CORPORATION

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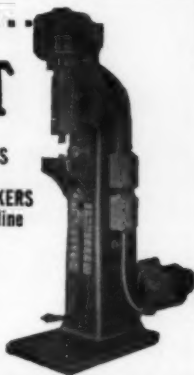
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**GRANT**

PIONEERS  
and  
PACEMAKERS  
in their line



head rivets from smallest to 1/2" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—sizes to meet all needs—types include Vertical and Horizontal Multiple Spindle.

Write for literature and don't forget to send samples

**THE GRANT MFG. & MACHINE CO.**  
CE Station Bridgeport 5, Conn.

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FOR AUTOMATIC CONTROLS



We make gears like these for a wide variety of pages, meters, indicators, controllers, etc. Tell us your needs.

20 to  
200 D.P.

Send your prints for quotations

- SPURS
- HELICALS
- WORM AND WORM GEARS
- STRAIGHT BEVELS
- LEAD SCREWS
- RATCHETS
- CLUSTER GEARS
- RACKS
- INTERNALS
- ODD SHAPES

THE Finest

IN GEARS

**Beaver Gear Works Inc.**

1033 PARMELE STREET, ROCKFORD, ILLINOIS

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June, 1960

SPECIFY

STANDARD



← **TAPER PINS**

ALSO FOR

- MACHINE RACKS
- WOODRUFF KEYS
- MACHINE KEYS

STANDARD TAPER PINS are milled from carefully selected bar stock for extremely close tolerances... straight to taper. The uniformity and accuracy of STANDARD TAPER PINS will save time on assembly... will assure you of trouble-free service. Available in STANDARD steel... also in stainless steel and brass. Specify STANDARD TAPER PINS and other STANDARD products.

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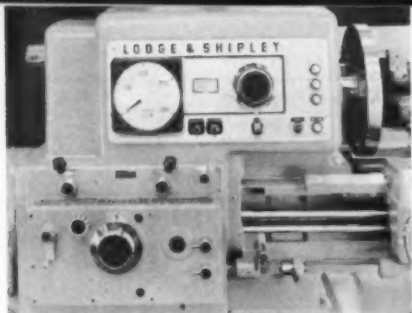
**STANDARD STEEL SPECIALTY CO.**

BEAVER FALLS • PENNSYLVANIA

Plants: Beaver Falls, Pa.; Hammond, Ind.

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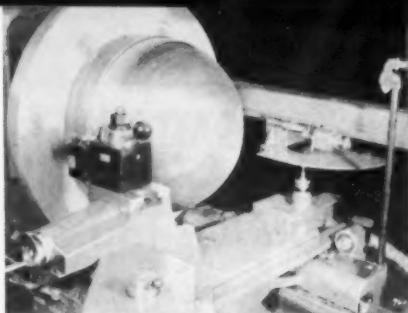
243



Constant cutting speed lathe control. This lathe is equipped with special three-speed mechanical shift headstock and a 20:1 variable speed drive. The three mechanical shift speed ranges are: 4.7 to 93, 21.6 to 431, and 100 to 2,000 rpm.

can be increased to provide a resultant tool path at 10° or even 5° to the centerline. Such ratios are ideal for venturi shapes, nozzles and other long, slender workpieces with relatively large diameter changes.

Other new features include: End gearing to permit reduced feed rates for extremely critical surface finishes; a cross-center facing arrangement that automatically brakes and stops the spindle as the tool reaches the centerline,



Turning a 26" diameter hemisphere on a 3220-32 Powerturn lathe.

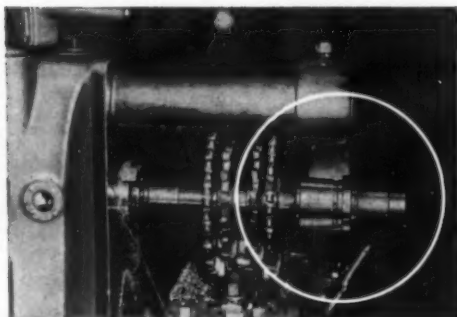
reverses and restarts spindle rotation. At the same time, feed direction is reversed and the tool continues feeding to the back side of center, all under tracer control. A special swivel arrangement permits mounting of an integral type spindle for contour grinding.

In addition to the special equipment mentioned, each lathe is fully equipped as a 45° Copymatic lathe and can be used as a standard tracing lathe at any time.

The Lodge & Shipley Co., 3055 Cole-rain Ave., Cincinnati 25, Ohio.

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## Replace the bronze bushing in your MILLING MACHINE ARBOR SUPPORT with a **Sonnet ROLLER BEARING**



Installed in minutes without machine rework. Requires no extra space; no adjustments. Extra sets of bushings provided to accommodate different size arbors. Permits full range of speeds and feeds of late model milling machines. Carbide cutters can be fully utilized.

- Faster speeds and feeds
- Maximum rigidity
- No chatter
- No bearing heating
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- No twisted arbors
- Longer cutter life
- Utilizes machine's lubrication system
- Increased production
- Better finishes
- Less maintenance
- Faster set-ups

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**SONNET**  
TOOL & MFG. CO.  
580 North Prairie Avenue  
Hawthorne, California

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### Bed Type Milling Machines Have Hydro-Mechanical Table Drive

Rigidity for heavy climb or conventional cuts plus flexibility for production or short runs are the strong features claimed for the new 100 and 200 Series Hypowermatic bed type milling machines. Heavily proportioned components, together with Cincinnati's new hydro-mechanical anti-backlash rack-and-pinion table drive and Dynapoise over-arm vibration damping are

said to permit chatterless machining at exceptionally high metal removal rates.

These mills are available in plain or duplex models, and can be furnished with either automatic rise-and-fall spindle carriers or with tracer-control of spindle carriers. Table widths are 12" for the 100 Series and 15" for the 200 Series. 12" tables are available in four lengths from 59" to 83" and 15" tables come in four lengths from 71" to 107". Feed rates are infinitely vari-

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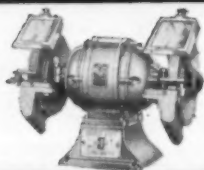
Ask for 24-page booklet, "How to make your own machine and repair parts quicker and easier."

***La Salle* STEEL CO.**

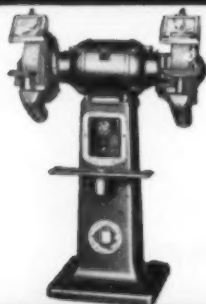
1480 150th Street, Hammond, Indiana

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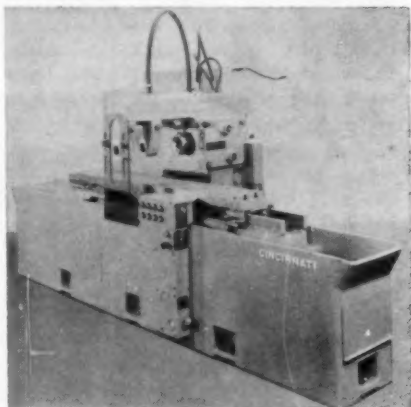
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able from 1" to 150" per minute. Rapid rate is 300" per minute.

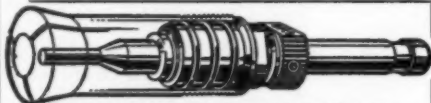
All spindles have 16 speeds with speed changes by means of pick-off gears. Standard spindle for the 100 Series Hypowermatic is 7½ hp with a range of 40-1600 rpm; a 5 hp spindle with 30-1200



Plain machine with tracer.

rpm range is optional. For the 200 Series 10 hp with 50-2000 rpm is standard, 7½ hp with 30-1200 rpm is optional and 15 hp with a speed range from 75-3000 rpm is available at extra cost.

Rise-and-fall and tracer-controlled Hypowermatics are equipped with Cincinnati's new Telematic control, a "peg-board" automatic control concept which allows the operator to program all machine functions for automatic cycles



### NEW! Self-Centering 5C Collet Stop

Quick friction adjustment. Stays in fixed position. Will not distort collet. Will not move back. Also available for other collets and spindles. 30 Days Free Trial. Several Territories Open for Distributors

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**THE BYSTROM COMPANY**  
6106 Park Ave. South Minneapolis 17, Minn.

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MACHINE and TOOL BLUE BOOK



in proper sequence by placing small pegs in holes of a peg-board.

Machine controls are conveniently and compactly located at the front right of the bed. A selector switch is provided to start and stop spindle. Feed rates from 1" to 150" can be selected quickly, with a single infinitely variable selector dial.

Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

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### Improved Model of Vibratron

A new, improved model of the Roto-Finish Vibratron is reported to eliminate the need for manual loading and unloading of parts and media.

A built-in, removable, double-decked vibrating separator in the base of the machine separates parts and media, as well as fragments from the media, in one simple operation. There is no need for an extra separator.



Unit has removable vibrating separator.

Primarily designed to finish complex cast, forged, stamped, and machined parts with hard-to-reach shielded and internal surfaces, the machine uses very short time cycles.

Roto-Finish Co., 3700 Milham Rd., P.O. Box 988, Kalamazoo, Mich.

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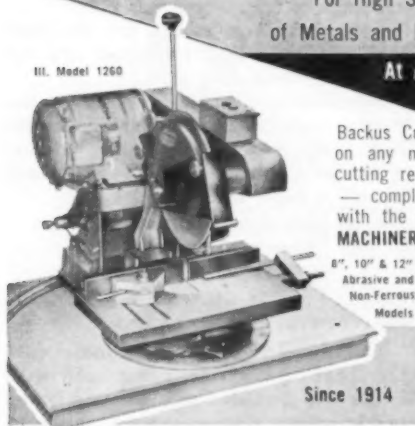
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Backus Cut-Off Machines make the finest precision cuts on any material, **at any angle**, to meet your most exacting cutting requirements. Precision engineered, these machines — complete-ready-to-operate — combine sturdy construction with the exclusive Backus leverage control. **SEE YOUR MACHINERY DEALER OR WRITE TO BACKUS FOR BROCHURE!**

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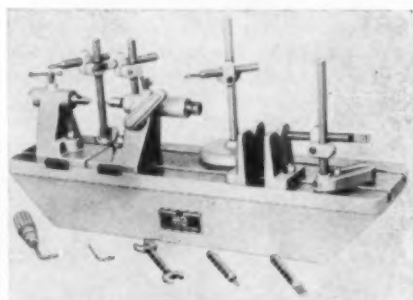
**TRAINING for INDUSTRY DIVISION**  
WHEATON, ILLINOIS

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## Bench Center and Surface Plate

The Model BC3 bench center and surface plate provides for accurately inspecting all types of work. Workpieces can be mounted between centers, in V-rests, or on precision ground surface plate. Runout is shown on the dial indicator as work is rotated by hand. Side runout or camming action can be checked with a second indicator. Parts without centers can be checked with the V-rests, furnished as standard equipment.

Rigidly mounted tailstocks can be



Work can be mounted between centers, in V-rests, or on surface plate.

positioned any place on the T-slot. Centers are alloy steel, hardened and precision ground. Carbide centers are available at extra cost.

Four indicator stands are standard with the unit. Dial indicators are not furnished with this unit.

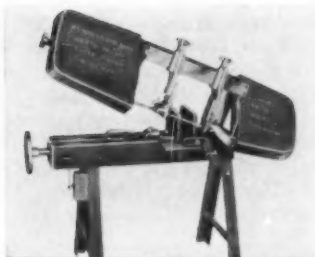
Specifications include: Distance between centers, 22"; centerline height from centers to plate, 4.130"; dia. of work over surface plate, 8¼", and length of base, 28".

K. O. Lee Co., Aberdeen, S.D.

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## Change in Model A-6 Horizontal Band Saw

The Model A-6 horizontal metal cutting band saw is now being built with a specially designed welded band frame and band cover to replace the cast type



formerly used. The new unit is said to provide a much more rigid and stronger

machine. The appearance of the cutting head has been modernized similar to the firm's larger machines.

This model has a cutting capacity of 6" x 10", uses a 94" x 1/2" x .025" blade, 1/3 hp motor, blade speeds of 60, 90, and 120 fpm.

A quick-action vise can be turned 45° for angle cutting, with a capacity of 5" x 6".

W. F. Wells & Sons, Inc., Three Rivers, Mich.

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Cincinnati 9, Ohio

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## KENTRALL Hardness Testers Are Motorized

By removing major test loads automatically, the new motorized Kentralls reduce operator error, increase reproducibility of test results, and raise the productive capacity of the machine—for the same price as hand operated testers.

The motorized Kentralls are available in Combination Testers which provide both Regular and Superficial Rockwell Hardness Testing in a single machine. For those applications that do not require the additional range, Kentrall also makes single purpose testers for either Regular or Superficial testing alone.

For complete information write for Bulletin CRS-60.

**KENTRALL**  
THE TORSION BALANCE COMPANY

Main Office and Factory:

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Sales Offices: Chicago, San Francisco

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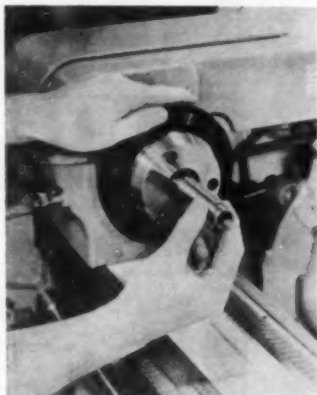
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252

## Chuck Has Range of .100" In Which to Chuck Any Dia. Bar

A new development in collet chucks for lathes, the Model 50, has a hand-wheel-operated, nose-type closure and "Rubber-Flex" collets.

The manufacturer claims his collet chuck offers easier, faster collet changing, capacity increases up to 42%, and



Chuck grips work easily due to hand wheel design and collet range.

a maximum runout of .001" at the nose. Bar capacity is from .100" to 1.063", with a chucking range of .100". It is also reported that tremendous gripping power is provided for heavy duty turning.

The new model can be used to chuck tubing and fragile materials and also hold round pieces on drill press tables,

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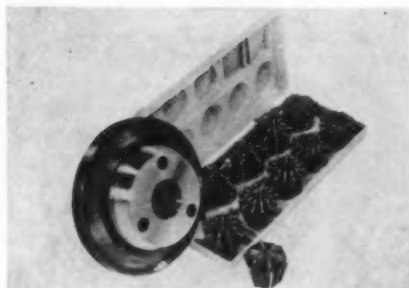
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ROUTE 22, MOUNTAIN SIDE, N.J.

Telephone: ADams 2-7300

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Chuck and set of ten "Rubber-Flex" collets.

milling machine tables, and magnetic chucks.

The chuck and a set of ten collets retails for \$135.00.

Jacobs Mfg. Co., West Hartford 10.

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### Punch & Die Maker Features Tilting Stroke Mechanism

The new Rice-Milwaukee Model PDM punch and die maker features tilting stroke mechanism, tilting table, infinitely variable speeds and strokes.

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Headed aluminum, tap #8  
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**Operations performed by Universal—Automatic machines and systems**  
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2-spindle horizontal machine with hopper. Single spindle vertical machine. Single spindle horizontal machine. Nut taper.

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Strokes are variable from 0 to 5"; speeds variable from 80 to 350 strokes per minute. Upper and lower arms of this heavy duty machine are power operated. The machine is designed to handle all small die making requirements.

Two table sizes are available—20"x20" and 24"x28".

Capacities are as follows: Accommodates maximum thickness 6" with overarms; 8" without overarms. Horizontal



Machine with 24" x 28" table.

sawing and filing capacity, small and large tables—with hold-down arms in place, small table 22½", large table 27"; without hold-down arms, small table 26", large table 31"; all to center of circles have above diameters.

Rice Pump & Machine Co., Belgium, Wis.

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**THE COLLIS CO.**

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## Automatic Recessing Tool Has Interchangeable Adapter

A new type of automatic recessing tool features an interchangeable snap-on work pilot adaptor which permits piloting of the tool in the work, as well as in a fixture bushing.

The work pilot adaptor is normally used on turret lathes, automatic screw machines and other equipment where the work is rotating. The tool may pilot in a fixture bushing on machines

## CAM MILLING

Fully equipped modern machine shop with extensive Jig Boring, Surface Grinding, Horizontal Boring and Thread Grinding facilities as well as modern Cam Milling and Cam Grinding equipment.

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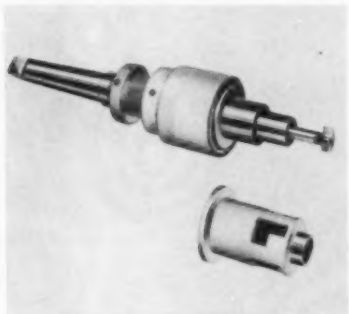
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where the spindle is turning.

The new design has only one joint to effect tool accuracy and features a solid, single-bar construction which minimizes tool chattering.

Three basic types of standard tools are made for work diameters from .375" to 2.250" and a depth of cut up to .281". Cutter heads are available



to perform a wide variety of intricate operations such as relieving, grooving, forming, back facing, chamfering, counterboring and necking. Recessing cutters perform these operations singly or in combinations.

Madison Industries, Inc., P.O. 1137, Providence 1, R.I.

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### Fine Adjustment of Chip Breaker Provided By Toolholder

The new Dial-A-Breaker Kendex toolholder permits fine adjustment of the chip breaker and close control of chips in machining operations. A

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WITH  
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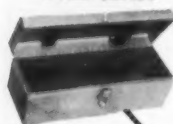
is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on all wheels up to 10" and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation.  
**Price \$80.50**



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## THE G-2 ANGLE DRESSER AND TOOL HOLDER

is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1°; an excellent time saver to set up jobs to be milled, drilled, tapped on any desired angle.



All for only  
**\$149.50**

(including case  
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of light-weight steel, with a hinged top, heavy duty latch and a blocked interior to insure the safety of the dressers when carried.

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knurled thumb nut or "dial" on a screw provides an infinite number of chip breaker positions. The adjusting nut is readily accessible on top of the toolholder regardless of tool position.

The solid Kennametal chip breaker, to which the screw is attached, retains



its position while indexing or changing inserts.

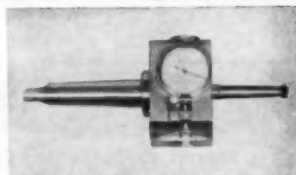
The holder is especially suitable for rear carriage positions and close gang-ing of tools because the chip breaker adjusting nut is on top of the tool and is exposed more than 180° for turning.

There are 70 styles and sizes of holders offered. Only two sizes of chip breakers are required for eight different sizes and styles of inserts. Each chip breaker can be used with either square or triangular inserts.

Kennametal Inc., Latrobe, Pa.

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## Boring Head Provides For Precision Boring—.000050"



The Bokumicro-Dial boring head is claimed to provide a way to get precise boring—within .000050". The head is equipped with two calibrated dials. The micrometer dial, used for quick adjustments, gives direct readings as the boring head is moved. The easy-to-

MACHINE and TOOL BLUE BOOK

read, conveniently located dial indicator is used to get hair-splitting accuracy.

The indicator actually reads the cutting tool movements and compensates for backlash, thread compression and other friction moving possibilities.

The tool slide can be adjusted from zero to  $\frac{1}{4}$ " off center. After the tool has been moved to its final position, it is stated that no clamping error can occur.

A gage block provided aids in centering.

Two models—one for the  $\frac{3}{8}$ " and one for the  $\frac{1}{2}$ " tool shanks—can be used in any vertical or horizontal boring and milling machine or any type of lathe.

Bokum Tool Co., Inc., 14775 Wildestone, Detroit 38.

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### Coil Cradles Have New Coil Guide Arrangement

The 2000 J Series "Easy Load" coil cradles have new coil guide plates

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located forward of and above the center of the coil. This guiding system eliminates side pressure on the lower portion of the coil, which is compressed by its own weight. This is said to permit fast, accurate feeding to the press without crimping of the stock edges.

Four models are available with maximum width capacities of 10", 15", 20" and 24". They all handle stock widths from 1" wide to the maximum width

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Four models offered—maximum width capacities of 10", 15", 20" and 24".

of the cradle. There is a maximum weight rating of 2,000 lb. A ½ hp motor powers the unit.

A standard feed rate of 90' per minute is incorporated. Other feed rates are available.

Rowe Machinery & Mfg. Co., 811 Regal Row, Dallas, Texas.

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### Double-End Automatic Threading Machine

Fast, accurate and rugged, the Grant, Model 2TM, double-end automatic threading machines are designed to operate simultaneously on both ends of such parts as tubes, rods and spindles. Work is placed in the magazine by the

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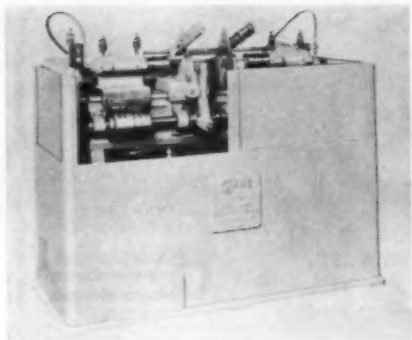
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MACHINE and TOOL BLUE BOOK



operator and drops by gravity into feed fingers. Transfer slides then convey each successive piece to a position between the clamping jaws, which firmly grip the work. The tool-heads, advanced by large drum-type cams at the front of the machine, perform their operation, withdraw, and the work is ejected. The entire machine cycle is completely automatic.

Each machine is easily adaptable to a range of diameters, lengths and number of threads per inch by simple changes in the cams, gearing, and clamp-jaw inserts, and adjustments in the magazine feed and tool-heads.

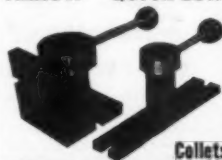
The Grant Mfg. & Machine Co., 90 Silliman Ave., Bridgeport 5, Conn.

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
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For drilling, tapping, milling, sawing, grinding, etc. Removes heat from cutting edges of tools and work. Feeds can be increased considerably, finer finishes and accuracy are obtained. TRICO-MIST absorbs heat, thereby quenching it faster than flood coolants which only transfer it. Chips slide freely up the tool face and are blown away automatically. Simple needle valve controls size and volume of mist spray. Attaches to shop air line. Available with one and five gallon containers—single or multiple outlets—single or dual valve control.

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MILWAUKEE WIS. U.S.A.

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# CONTINUOUS HINGES

OPEN

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

**THREE-FOURTHS  
OFFSET**

**AUTO MOULDING  
& MFG. CO.**

**1110 E. 87TH ST.  
CHICAGO 19, ILL.**

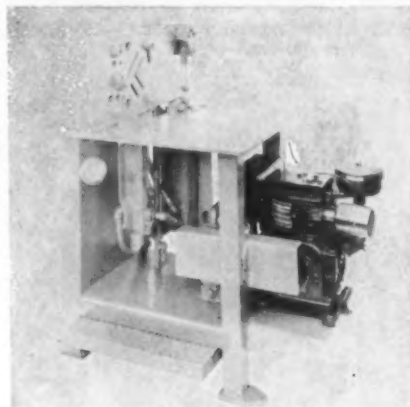
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**SPECIFICATIONS**  
Open width  $\frac{7}{8}$ " to 6"  
Gage Material .040 to .125  
Pin Diameter .101 to  $\frac{1}{4}$ "  
Lengths to 120"

**SEMI-OFFSET**

OPEN

which has a 5 hp, 5 cycle gasoline engine. This machine is an addition to the



Shears round, square, flat and angle iron.

line of Shearease machines manufactured by The Shearease Co.

Capacity that can be sheared is 1"

round, 1" square,  $3\frac{1}{2}$ " x  $\frac{3}{4}$ " flat and  $4"$  x  $4"$  x  $\frac{3}{8}"$  angle iron as well as smaller bar and angle sizes.

The self contained portable unit, weighing approximately 650 lb. is hydraulically operated with a vane pump. When necessary the blades can be re-sharpened on a surface grinder, giving the blades a life of over a million strokes. Replacement blades are interchangeable and available from stock.

The Shearease Co., P.O. Box 125, Torrance, Calif.

Use postpaid card. Circle No. 105

## Multiple Position Work Tables

A line of multiple position work tables with built-in power transfer switches has been developed for numerous induction heating applications such as, soldering, brazing, bombarding, and heat treating.

As illustrated, the set-up on the left shows a five-piece assembly being soldered in one open end coil using

*You Need an Extra Hand Now  
to Speed Up Production!*

## HEIMANN TRANSFER SCREW SETS



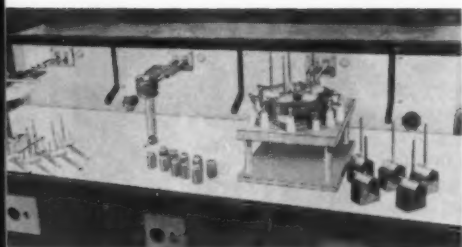
IN 11 SIZES—No. 6 to 1"  
N.C. In all S.A.E. sizes.

Here is the faster, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money tool

**HEIMANN MFG. CO. • URBANA, OHIO**

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pre-formed solder rings; in the center, tungsten contacts are being brazed to

brass bodies using silver solder, and on the right, five copper and brass assemblies are being soldered within one heating coil. All three operations can be kept going without loss of time.

Each station can be operated by push-button, footswitch or timer.

Work tables can also be built with quench tanks for heat treating.

Lepel High Frequency Laboratories, Inc., 55th St. & 37th Ave., Woodside, New York.

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# Vibration eliminated to 0.000,010"

Sensitivity: Measurable unbalance displacement: (10 micro-inches) 0.000,010" ● Measurable max. unbalance displacement double amplitude: 0.375" ● Dynamic, pure static, or Force-Couple Indication ● Easy to operate and maintain — locate anywhere ● No foundations or hold-downs needed ● Rotor weight: 4 oz. to 100 lbs.

## dynamic balancer

Model MU-6

for rotors, armatures, impellers, pulleys, drums, etc.



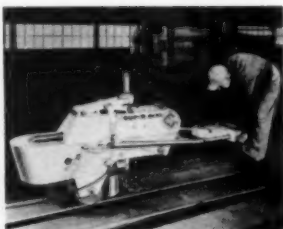
For further information write to—  
MICRO BALANCING INC., Herricks Rd., Garden City Park, L. I., N. Y.  
West Coast Representatives: Electronic Balancing Co., Long Beach, California

Use postpaid card. Circle No. 421

### Portable Unit Drills Up to 1½" Dia. Holes

The 730 lb. Magnetic SUP-R drill is designed for drilling heavy structural shapes and other heavy metal drilling. The portable unit drills, reams, or countersinks up to 1½" dia. holes (larger, when an adapter is used). Only one man is required for operation. Some of the special features reported include a one-ton holding magnet for positive positioning, hole accuracy, and max. drill point pressure; lowest possible center of gravity, for easy maneuvering, added safety, and full 5 hp electric motor with four-speed gear shift.

Guibert Steel Co., Pittsburgh 5.

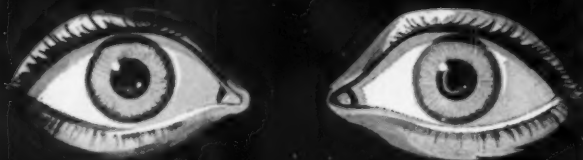


Frequently does work assigned to radial, wall, gantry, other fixed installation drills.

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Producers of  
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Tool Taps,  
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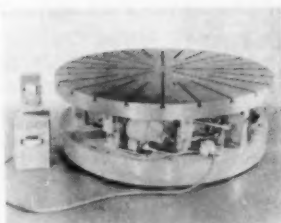
**ADAMAS** CARBIDE  
CORPORATION  
KENILWORTH, NEW JERSEY

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## 102" Precision Horizontal Rotary Table

Claimed to be one of the largest precision horizontal rotary tables ever built, a table 102" in dia. with a bearing load capacity of 90,000 lb. has been produced. The manufacturer states this explosion proof table features an accuracy of five seconds of an arc, certified by auto-collimator reading. Preliminary rotation positioning is achieved by a visible counter reading from 000° to 359°. Final positioning is manual, with aid of a microscope. Adjusting speed motor drive is from zero to 1/3 rpm (108" per minute). Other sizes offered.

Machine Prod. Corp., 6771 E. McNichols, Detroit 12.



For inspection, machining operations.

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## Sentry Hardened Tools

## Stay Sharper Longer

There's no better "insurance" against costly, premature dulling of your high speed production tools than reliable Sentry hardening. Sentry's unique Diamond Block provides a truly neutral atmosphere that permits heat treating for maximum hardness without danger of scale or decarburization... keeps your production tools sharper longer.

*Like a free demonstration? Send us your sample high speed steel tool and we'll Sentry harden it for you free of charge.*

9-0



# Sentry

TRADEMARK

## ELECTRIC FURNACES

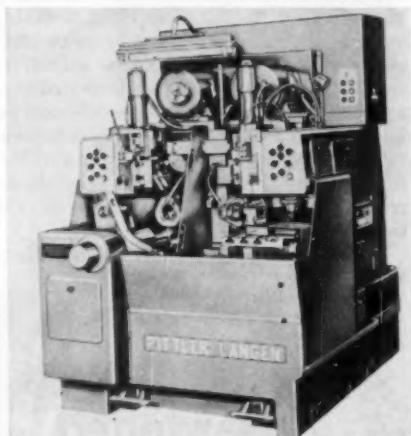
Request Catalog J-5. Write THE SENTRY CO., FOXBORO, MASS.

Use postpaid card. Circle No. 423

## Automatic Two Spindle Chucking Machine For Finishing Operations

The new Pittler "Pidofat" is an automatic, two spindle chucking machine for economical internal and external front operation finishing of castings, forgings, gears, wheels, flanges, bevels, etc.—on a production or even a short-run basis. The spindles are independently driven by their own 13.5 hp motors, and have eight working speeds each. The left-hand spindle is provided with a turret slide having three index positions suitable for close-tolerance boring operations. A separate program-controlled compound slide does longitudinal and transverse cutting operations of any desired contour.

The right spindle has a heavy-duty cross-slide to do internal and external turning, and a compound slide similar to that on the left spindle. This top slide, however, is suitable for operation as a fully automatic copying device. The independently adjustable feed rate remains constant in any copying direction.



A separate program-controlled compound slide does longitudinal and transverse cutting operations of any desired contour.

Proper working speeds are automatically obtained through an electro-hydraulic system, in accordance with

**NUMBERALL**  
GIVE THE COST OF STAMPING NUMBERS

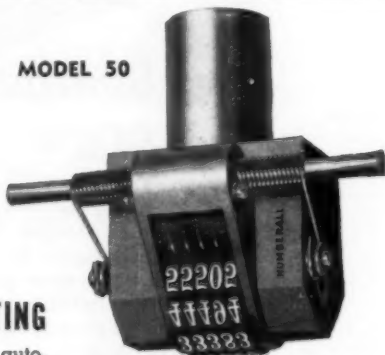
## AUTOMATIC NUMBERING HEAD

**STURDY / ACCURATE / LONG LASTING**

Rapid consecutive character wheels advance automatically after each stamping. Clear, uniform impressions. Wheel and index plate one piece unit, sturdier . . . greater uniformity. Index plate cannot become loose or out of alignment. Wheels available with Round Face characters for low-strain marking. Write for bulletin 50N.

**NUMBERALL STAMP & TOOL CO.**  
HUGUENOT PARK STATEN ISLAND 12, N. Y.

**MODEL 50**



**TO NUMBER  
METAL  
PRODUCTS**

Use postpaid card. Circle No. 424

program settings.

Idle time for positioning of cutting tools is reduced through a built-in rapid traverse device.

Maximum turning diameter, 9.1"; maximum swing, 9.5"; speed range 14-1500 rpm; feeds, .32-16"/min.

Accessories include copying attachments, coolant pumps, a chip removal conveyor, recessing and facing attachments, etc.

A similar single-spindle machine, the "Pifat" is also available.

Cosa Corp., 405 Lexington Ave., New York 17.

Use postpaid card. Circle No. 109

### Machine Chamfers Tubing Of Various Dims. and Length

A new Acme double end deburring machine automatically chamfers the ID, OD and face of tubular steel parts of various diameters and lengths. Tubing from 3/4" to 2 1/4" dia. and from 2 1/2" to 24" long is reported to be deburred by

## for Solid Satisfaction

there's nothing like ***solid*** Quality



The illustration shows two tapered pins, one larger and one smaller, both with a conical end. Below them is a box labeled "100 TAPER PINS" with the Stanho logo. To the right of the pins is the Stanho logo, which consists of the word "STEEL" in a small oval, "Stanho" in a large oval, and "PRODUCTS" in a smaller oval below it.

## TAPER PINS

...they're solid, boss—

**S-O-L-I-D**

You're sure of strength, precision and satisfaction with Stanho solid Taper Pins . . . uniformly made to close tolerances from selected stock, microscopically free from defects. Likewise: Straight Pins, Cotter Pins, Woodruff Keys, all types of Machine Keys and Special Steel Parts. Available also in Stainless, Monel, Brass, Aluminum and other metals. Modern manufacturing methods, utilizing automatic machines, assure economical production prices. Bulk or packaged.

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Since  
1872

# STANDARD

*HORSE NAIL Corporation*

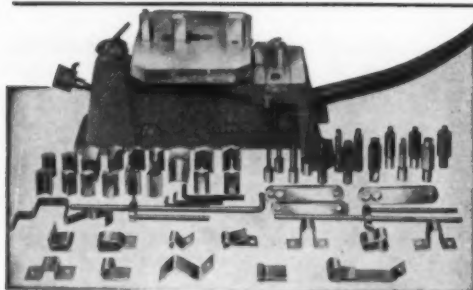
NEW BRIGHTON, PA. (Pittsburgh District)

Use postpaid card. Circle No. 425

JM-10

June, 1960

265



## Multiform BENDER CUTTER

### CUTS, BENDS, PUNCHES

Available in hand, air and hydraulic models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to punch, bend, and cut round or flat brass, bronze, aluminum, steel, etc., up to  $\frac{1}{4}$ " x  $1\frac{1}{2}$ " as illustrated, other models up to  $\frac{1}{2}$ " x 8".

**J. A. RICHARDS CO.**  
KALAMAZOO, MICH.

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this machine at production rates up to 6,000 pieces per hour. Fixtures are de-

chine is completely mechanically operated.

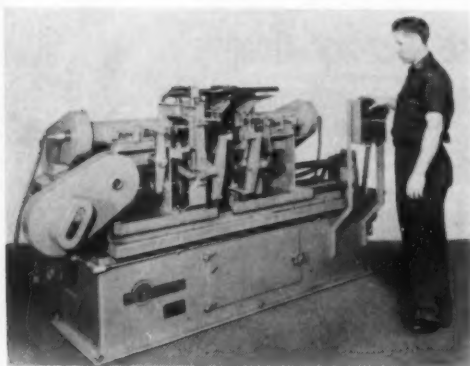
A variable speed program shift, extending the entire length of the machine, synchronizes all automatic operations.

Tubes are manually loaded into a vertical magazine in the machine to insure proper positioning. A walking beam type transfer mechanism automatically transfers the tubes from the magazine to the work station chuck jaws and ejects finished tubes from the machine.

When the tubes are clamped in the work station, drum cams drive two opposed deburring tools into each end of the tube. After deburring operations have been completed, the drum cam retracts the deburring tools, the finished tube is automatically ejected from the machine, and the next tube to be deburred is transferred to the chuck jaws by the transfer mechanism.

Acme Manufacturing Co., 1400 E. Nine Mile Rd., Detroit 20, Mich.

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A variable speed program shift, extending the entire length of the machine, synchronizes all automatic operations. It actuates tube transfer operations, opens and closes chuck jaws, operates work spindles, etc.

signed to permit rapid tool change from one tube diameter to another. The ma-



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**MICRO MINIATURE END MILLS**

2 Flute  $1/32$  through  $3/16$  by  $1/64$ s  
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**ALL SIZES SINGLE AND DOUBLE END**

2 and 3 Flute Flat or Ball End—4 Flute Flat End Only

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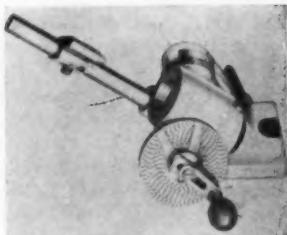
**WOODSON TOOL CO.** 4811 Lennox Blvd. Inglewood, Calif.

Write for Catalog



### Dividing Head

This dividing head is designed for use in instrument and model shops to produce a wide variety of small precision parts with a minimum of set up time and effort. Minimum overhang is featured, as well as rigidity of height and weight which permits use readily on rotary tables, milling machines, surface grinders, etc. The spindle affords 1" capacity with the use of 5C collets, concentricity within .0002, 360° swing in a vertical plane and indexing accuracy of one minute of arc. Falcon Machine & Tool Co., 200 Concord Turnpike, Cambridge, Mass.



Featured is minimum overhang.  
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## Free Technical Bulletin on Surface Measurement

gives all the meat of ASA Standard B46.1-1955 on surface roughness, waviness and lay, plus helpful supplementary material. Arranged for easy reading and convenient reference. Includes these sections:

- Basic definitions—with profile records of typical surfaces.
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MANUFACTURING COMPANY

345 S. MAIN ST., ANN ARBOR 4, MICHIGAN

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**180 AMP ARC WELDER.** Dial type control provides easy, positive setting of welder output over a wide amperage range. Electrodes from the smallest to 3/16" size can be used to weld materials from 20 ga. to 1/2" or thicker plate. The unit welds mild steel, low alloy steel, and 18-8 type stainless steels. Operation is on 220 volt single phase power supply. The approximately \$145.00 price includes cables, headshield, electrode holder, ground clamp and power input connections. The Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio.

Use postpaid card. Circle No. 112



## **suspension type FLEXIBLE SHAFT MACHINE**

**eliminates tooling problem for I.B.M.**



International Business Machines Corporation had the problem of reaming holes .813" in diameter in the mounting hanger on the main base of their 407 Accounting Machine. To eliminate expensive tooling for this operation, they selected a STOW V50 portable flexible shaft machine, specially fitted with an on-off switch mounted on the handpiece.

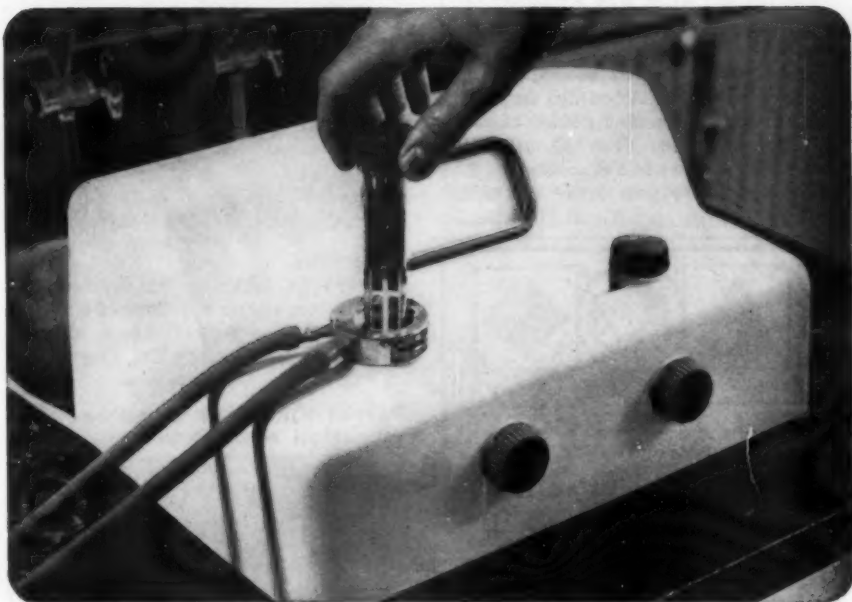
The V50 machine delivers 1150, 2100, 3450, or 5750 RPM, is furnished with a 6 foot flexible shaft. Other speeds can be achieved by using different size pulleys (I.B.M. ran the reamer at 750 RPM.) Available in either 3/4, 1, 1 1/2 or 3 HP, the

V50 can be used for grinding, buffing, sanding, wire brushing and drilling.

**STOW MANUFACTURING CO.**  
30 Shear Street Binghamton, New York

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**Experience—the added alloy in Allegheny Ludlum tool steels**



**COLORIMETER** (inherently extremely accurate) determines percentages of molybdenum, tungsten, cobalt and manganese in A-L tool steel to insure consistent, high quality.

## **Colorimeter measures exact chemical composition of Allegheny Ludlum tool steel melts**

**Accurate adjustment of alloys guarantees uniform heat treatment, predictable dimensional changes, reduced grinding, standardized machining operations.**

Close control of molybdenum, tungsten, cobalt and manganese is at the heart of a good tool steel melt. In addition to the usual testing methods, Allegheny Ludlum's chemical laboratory checks these metals with Colorimetry because of its inherent, extreme accuracy.

On the basis of the Colorimeter's findings, it is possible to make carefully calculated furnace additions of ferro-alloys, insuring precise control over chemistry. This guarantees your receiving the exact analysis order after order, providing *uniformity of heat treatment, predictable dimensional changes, reduced grinding and standardized machining operations.*

MM-7000

Colorimetry is but one step toward careful control over composition. Allegheny Ludlum also sets exacting purchasing specifications on raw materials and scrap. Quality Control checks all incoming orders to see that they conform with these specifications. Another guard toward your getting your exact specifications: each ingot bears a metal tab showing heat number.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.

**ALLEGHENY LUDLUM STEEL CORPORATION,**  
Oliver Bldg., Pittsburgh 22, Pa. Address Dept. MB-6

### **ALLEGHENY LUDLUM**

Tool Steel warehouse stocks throughout the country... Check the yellow pages  
every grade of tool steel... every help in using it

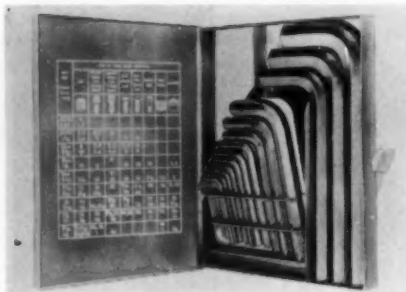


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### Kit Holds Keys To Fit Most Allen Hex-Socket Screws

The No. 667 Allen Key Kit holds hex-socket screw keys in a wide range of sizes to fit all except the largest diameter Allen hex-socket screws.

The kit holds 18 Allen hex keys in a range from the smallest (.028") through 5/8" hex diameter. They fit all Allen hex-socket screws in that category. The kit also includes new 7/64" and 9/64" sizes for No. 6 and No. 8 "60" Series



cap screws.

A key fit table on the inside cover of the box shows the correct key size for each Allen socket screw product.

Allen Manufacturing Co., Hartford 1.

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Complete "specs" on Johnson line of Inclined, Straight Side, Gap and Horn Presses.

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JOHNSON MACHINE & PRESS CORP.  
620 W. INDIANA AVE., ELKHART, INDIANA

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### Barrel Finishers Combine Vibration with Rotation



A complete line of Vibraslide barrel finishing machines—including two new,

"Donut"-type fluorescent fixtures direct light into work without heat, shadows, obstruction. Wide application... easy installation... free literature.

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**STANDARD BORING MILL LITE CO.**  
6771 E. McNichols • DETROIT 12, MICH.

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MACHINE and TOOL BLUE BOOK

smaller models—is now available through the 3M company's distributors for Honite brand products. The Vibraslide 5 and Vibraslide 10 are in addition to the original machine, still offered in 20 cu. ft. size. It is stated that "Vibraslide" is the only barrel finishing machine combining vibration with rotation.

In the smaller barrels, speed of finish is increased because of greater ampli-

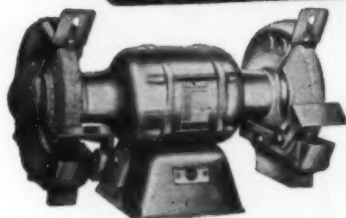
tudes of vibration, the 3M company points out.

With rotation in addition to vibration, it is possible to mass finish parts not previously adaptable to barrel finishing because of shape, material or size. The machines can also be used as regular rotating barrels.

Minnesota Mining and Manufacturing Co., 900 Bush Ave., St. Paul 6, Minn.

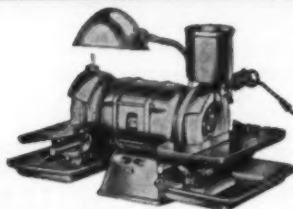
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### CARBIDE TOOL GRINDER



Model 153-6". Reversible ½ HP motor, 3450 RPM. 1½" wide wheels. Every part oversize for rugged, long-lasting use. Just \$201.80

# BALDOR

## MODEL 153-8"

Feature for feature, no other grinder offers so much for so little. Compare HP rating, wheel size, shaft diameter, bearing size with any other similar-type grinder. You'll quickly see why you get *more* with *Baldor*!

- Big ½ HP motor; won't burnout even if repeatedly overloaded!
- Wide-clearance design provides maximum working room!
- Large 8" first grade wheels!
- Heavier ¾" arbor; larger ball-bearings!
- Dynamically-balanced rotor—extra smooth operation!
- Exhaust-type guards!

Write today for Bulletin 321N on complete line of Baldor Grinders and Buffers!

## BALDOR ELECTRIC CO.

4353 DUNCAN AVE. ST. LOUIS 10, MO.

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### Pre-Packaged Magnetic Particle Inspection Materials

A new development by Magnaflux Corp. is the convenience of magnetic particle inspection materials available in pressurized spray cans and plastic squeeze-bottles. This makes tests easier, when used in field testing and on parts of complex shape being tested on large wet-type Magnaflux units. The No. 14M Fluorescent Magnaglo Bath and No. 9 BM Magnaflux Bath are offered in 12 oz. pressure spray cans. The No. 1 Gray Powder is now available in plastic dispensers, one lb. of material.

Magnaflux Corp., 7300 W. Lawrence Ave., Chi. 31.



Testing premagnetized part for cracks.

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**FOR PEAK TOOL BIT  
PERFORMANCE  
PICK**



# SUPREME

Use this unique steel for the very ultimate in cutting prowess. Highest hardness, highest wear resistance make **Vasco Supreme** the aristocrat of the shop when you want the most! Where production economics call for different bits, use **Neatro, Red Cut Superior, Red Cut Cobalt**—each a profit-maker in its range. *Write for Data Sheets.*

**VANADIUM-ALLOYS STEEL COMPANY  
LATROBE, PENNSYLVANIA**

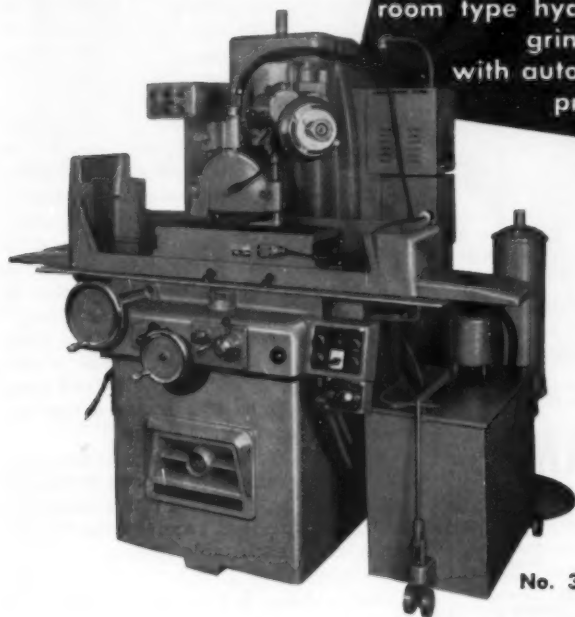
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new

# **INCREMATIC** downfeed

all Grand Rapids precision tool room type hydraulic feed surface grinders now available with automated cut out after pre-set stock removal



No. 350

Plus other features, too, such as: Rugged, one-piece column and base casting • Greased-for-life precision ball bearing spindle • Instantly variable hydraulic table speed • Variable speed hydraulic cross feed and continuous cross feed • Powered vertical movement of wheel head.

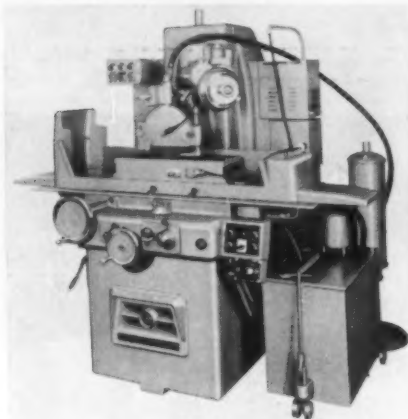


A note on your letterhead will bring full details

**GALLMEYER & LIVINGSTON CO.**  
405 Straight Ave., S.W., Grand Rapids, Mich.

Use postpaid card. Circle No. 436

## Surface Grinder with Automatic Down Feed



Incremental down feed, a new automatic down feed device which permits operator to preset amount of stock to be removed and which automatically

shuts off after stock removal, is now available on all Grand Rapids saddle type surface grinders from 6" x 18" to 24" x 48" table size.

Incremental down feed makes possible complete automatic surface and plunge grinding to extreme repeat accuracy with utmost simplicity. It is also reported to permit the operator to direct dial the amount of stock to be removed in increments of .01" to .0001" and always leaves .0001" for finish pass before going into three pass "spark-out" which automatically shuts off machine.

For automatic surface grinding, the part to be ground is secured to the magnetic chuck or work surface of the machine and grinding wheel is advanced until it makes contact with work. Then total amount of stock to be removed is present. Rate of stock removal is selected and surface plunge selector is set so automatic feed receives "feed" impulses at each reversal of the machine saddle. Automatic cycle is set for surface grinding and auto-feed start button is pressed to place feed mechanism in operation.

Automatic plunge grinding is the same except surface plunge selector is placed in "plunge" position. In this position, the automatic feed receives the "feed" impulses at each table reversal.

Gallmeyer & Livingston Co., 336 Straight Ave., S.W., Grand Rapids 2, Mich.

Use postpaid card. Circle No. 115

"Jorgensen"  
and  
"Pony"

## CLAMPS

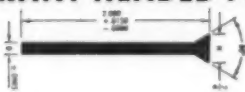


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**ADJUSTABLE CLAMP CO.**  
the clamp folks  
403 N. Ashland, Chicago 22, Ill.

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## DURANT HEADED PINS



All tool steel Rockwell C 58/60 — honed finish, no pickup — heads left soft and are guaranteed uniform. Attractively priced at \$12. to \$19. per C. We manufacture 103 and stock 103 sizes for immediate delivery.

Available through our distributor or order direct.

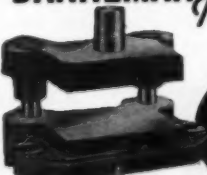
Write for complete prices and details.



Use postpaid card. Circle No. 438

## DANNEMAN

*Precision*  
**DIE SETS**



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bored on  
master  
plates

Catalog  
on  
request

## DANNEMAN DIE SET DIVISION

Acme-Danneman Company, Inc.  
203 Lafayette St., New York 12 • AL 5-7150

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MACHINE and TOOL BLUE BOOK

# *new* POPE

## INTERNAL Precision Grinding SPINDLES

used on BROWN & SHARPE

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LANDIS  
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REID  
THOMPSON  
SPRINGFIELD  
and others

**with  
important  
new features  
that add up to**

### **TOLERANCES TO MILLIONTHS**

super-precision bearings made to Pope specifications and used exclusively in Pope spindles

total eccentricity of shaft, measured in the tapered hole, will not exceed 20 millionths (.000020)

Assembled spindles are dynamically balanced with all rotating parts in full assembly to 25 millionths (.000025) amplitude of vibration. This assures low micro-inch surface finishes.

### **INCREASED PRODUCTION**

Pope Spindles have the rigidity and the ability to take heavy cuts and produce uniform parts.

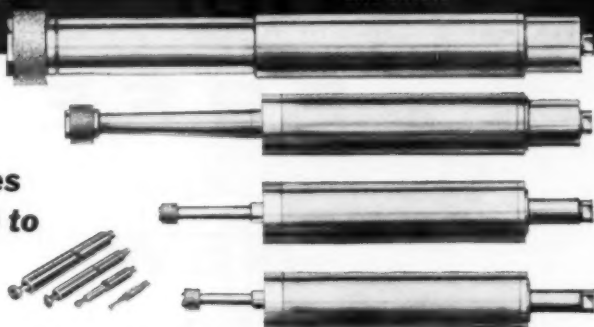
### **LOWER OPERATING AND MAINTENANCE COST**

Increased wheel life because the extra large shaft is rigidly supported by ample size bearings.

Saved operating time — one motor driving pulley serves all spindles in most cases.

Permanent lubrication — Pope system of grease lubrication prolongs bearing life, minimizes maintenance expense, and the spindles run cool.

New concealed axial air flow coolant repelling flinger increases bearing life and reduces maintenance expense.



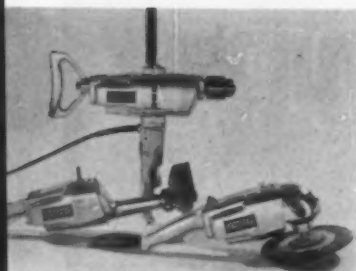
# POPE®

**ENGINEERS, DESIGNS AND BUILDS  
PRECISION ANTI-FRICTION BEARING SPINDLES  
FOR EVERY PURPOSE**

**POPE MACHINERY CORPORATION • 261 RIVER STREET • HAVERHILL, MASS.**

*Established 1920*

Use postpaid card. Circle No. 440



Lighter weight, more powerful.

#### 16 New Portable Power Tools

A completely new line of 16 portable power tools includes 10 heavy-duty drills, in a range of ½", ¾", 1" and 1¼" sizes; three heavy-duty disc sanders in 7" and 9" sizes; a 7" polisher, and two portable grinders in 5" and 6" sizes. Tools are said to be up to 35% lighter in weight, up to 100% more powerful, and have been designed to give more effortless operation through precision balance, better control, greater durability, lighter weight.

Dept. PD, Stanley Electric Tools, Div. of The Stanley Works, 195 Lake St., New Britain, Conn.

Use postpaid card. Circle No. 117

# FREE

*to metalworking management!*

# NEW

*16-page illustrated booklet*

Vapor-from-paper  
STOPS RUST

Now, you can "mothball" your metal parts or products as easily as your wife protects her woollens. This new booklet tells how Ludlow VPI® Wrap cuts costs in shipping and storage. Read how other companies have saved by

modernizing their preservation methods. It's FREE! Ludlow Papers, Needham Heights, Mass. Dept. 166.



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### Filter Handles 200 to 2,500 GPM Coolant Continuously

Paper filter medium in the new Hoffman Hi-Flo Vacu-Matic filter handling water soluble coolants at flow rates from 200 gpm to 2,500 gpm is shown being indexed automatically. Separation of spent filter paper, sludge, and chips is achieved mechanically. There is no shut-off of dirty coolant through the filter. Filtering is continuous with the sorting of paper from scrap eliminated. Operation is entirely electrical and continuous without use of solenoids, air cylinders or control valves.

U. S. Hoffman Machinery Corp., 103 Fourth Ave., N.Y.C. 3.

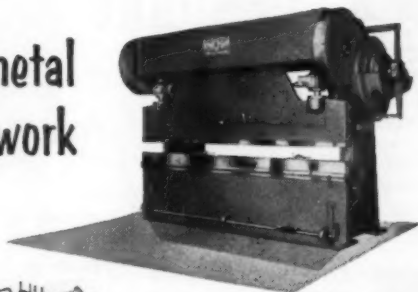


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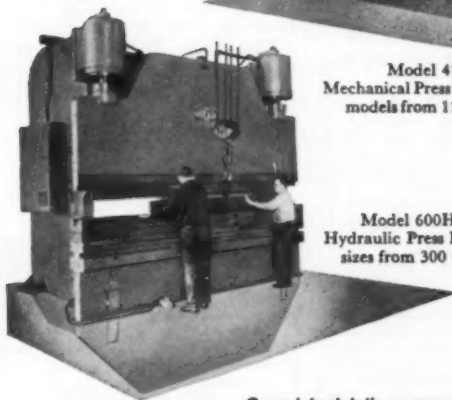
## CHICAGO® PRESS BRAKES

UNEXCELLED ACCURACY

for sheet metal  
and plate work



Model 410D, 90-Ton CHICAGO Mechanical Press Brake. Other standard models from 11 to 450 ton capacities.



Model 600H10, 600-Ton CHICAGO Hydraulic Press Brake. Other standard sizes from 300 to 2000 ton capacities.

9469

*Complete details or recommendations  
on any press brake work upon request*

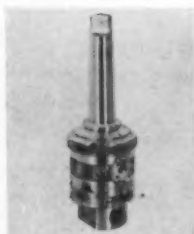
Press Brakes  
Press Brake Dies  
Straight-Side-Type Presses  
Hand and Power Bending Brakes  
Special Forming Machines



**DREIS & KRUMP  
MANUFACTURING CO.**

7440 S. Loomis Blvd., Chicago 36, Illinois

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**DUPLEX COMBINED BORING AND FACING TOOL HEADS.** The new 1960 models include improvements such as a means of attaching the shanks to the body, precluding chance of breakage. Over-all body height has been reduced 1", affording extra rigidity. New dual means provide take-up for wear, which is said to permit the operator to keep the tool in perfect adjustment at all times. Chandler Tool Co., Muncie, Ind.

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### Aluminum Step Blocks Used With Plain Or Step Clamps

Northwestern Tools is presenting nine

sizes of aluminum step blocks which can be used with either plain or step clamps. This comprises three sizes of



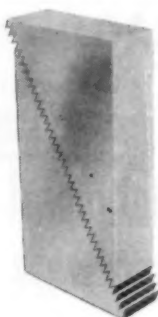
### WIND YOUR OWN SPRINGS

Porter Spring  
Winder

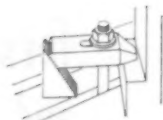
Widely used to make springs to 1½-inch I.D., for repair, experimental work and small production runs. Low in cost. Handles wire to 3/16" diameter. WRITE FOR CATALOG.

ADVANCE CAR MOVER COMPANY, INC.  
APPLETON, WISCONSIN

Use postpaid card. Circle No. 443



USED WITH PLAIN CLAMPS



USED WITH STEP CLAMPS

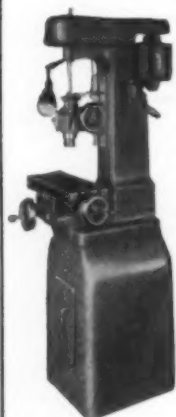
standard blocks 1" wide, three sizes of heavy duty blocks 1½" wide, and three sizes of double duty blocks 2" wide.

The step blocks are interchangeable with each other, with all sizes of steel step blocks, and with all sizes of step clamps.

Northwestern Tools, Inc., 118 Hollier Ave., Dayton 3, Ohio.

Use postpaid card. Circle No. 120

### LINLEY JIG BORERS



Give You Maximum  
Utility—At Low Cost

The improved Linley Jig Borers are more efficient than ever. Accurate and fast in operation—easy to set up. Made for the exacting requirements of small part precision work. Using Linley Jig Borers allows larger capacity borers to be used where intended, on heavier jobs. Once you've installed a Linley, you'll wonder how you got along without it in your shop.

Table Size: 7" x 17½"  
Table Travel: 6½" x 10"

Send for Complete  
details.

**LINLEY BROTHERS CO.**

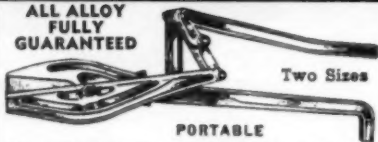
JIG BORERS - RIVET SPINNERS

663 State St. Ext., Bridgeport 1, Conn.

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### BREMIL The IMPROVED Compound Lever Shears

ALL ALLOY  
FULLY  
GUARANTEED



Two Sizes

PORTABLE

No. 1 cuts up to No. 11 gauge strip or sheet.  
No. 2 cuts up to ½" steel plate.

**BREMIL MFG. CO.**

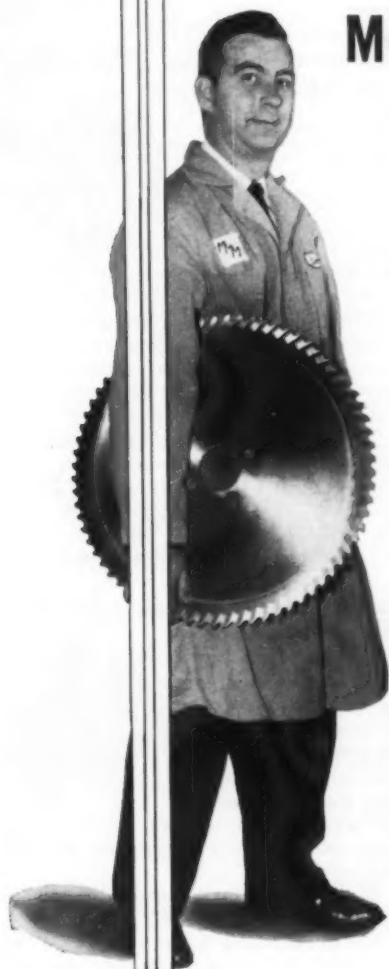
1020 Holland Street, Erie, Penna.

Use postpaid card. Circle No. 445

MACHINE and TOOL BLUE BOOK



# Motch & Merryweather will send a sharp engineer



...A sawing specialist, that is, who can show you how to get the most out of your sawing and sharpening equipment. When you select Motch & Merryweather saw blades you get top quality and top service. Call your M&M distributor.

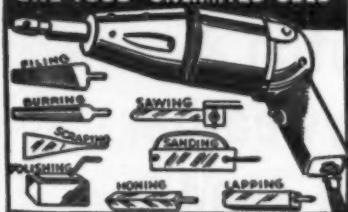


**Cutting Tool  
Manufacturing Division**  
Cleveland 17, Ohio

**STOP . . .**

## **HAND WORK**

### **ONE TOOL - UNLIMITED USES**



Use these Handy PORTABLE ELECTRIC RECIPROCATING TOOLS for Greater Production, Better, More Uniform Work — All with less Operator Fatigue. Fixed strokes are  $\frac{1}{8}$ " or  $\frac{3}{8}$ " long. Operate on 110 Volts AC-DC. Deliver 1000 PUSH-PULL strokes per minute. Try one of these tools on your next job.

Send for Descriptive Literature.

**ACME TOOL CORP.**

73 W. BROADWAY • NEW YORK 7, N.Y.

Use postpaid card. Circle No. 447

**ACCURACY is an ECONOMY!**  
and only precision offers you  
**HIGHEST QUALITY!**

now is the  
time

to put your  
OLD STEEL

**PARALLELS to "LIKE NEW"**

conditions and to be ready for the big push.



For the first time Anton Machine Works offers to regrind your old parallels to the following tolerances:

- Parallelism and straightness over length of 6"  $\pm$  .0001
- Size tolerance between a pair  $\pm$  .00005. A complete list of new parallels in stock will be mailed on request.

**ANTON MACHINE WORKS**

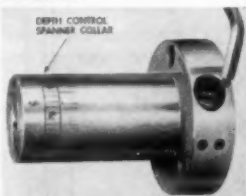
1226 FLUSHING AVE., BROOKLYN 37, N. Y.

Use postpaid card. Circle No. 448

280

## **Precision Boring Quills Allow "Infinite Size Control"**

Precision boring quills are said to allow infinite adjustments in controlling the size of holes without loosening or tightening screws. The new quills also permit incorporating depth-control adjustment when required. (top photo).



Now the user can "split tenths" (adjust smaller than  $1/10,000$ ") to compensate for tool wear by adjusting with a hex-key. Adjustment is accomplished by a small worm-gear drive. This mechanism connected with bar and bar holder provides a positive drive, preventing backlash and slippage when tool is in use (bottom photo).

Quills available fit all standard boring spindles; specials on order.

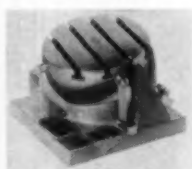
Prices start at approximately \$275.

Briney Mfg. Co., 1165 Seba Rd., Pontiac, Mich.

Use postpaid card. Circle No. 121

## **Compound Angle Sine Table**

The Matrix high precision sine table, reported accurate to within 10 seconds of arc, is used for inspection of jigs, and gages and for the manufacture of components in the machine shop on grinding and jig boring machines.



Illustrated is the 9" size; also offered in 13", 18", 26", and 36" dias.

An outstanding feature reported for the table is the substitution for the conventional hinged bearings at 90° of a hemisphere riding in a conical seat

MACHINE and TOOL BLUE BOOK

and permitting any angle up to 45° to be set as a single or as a compound angle.

Table can be used also with Auto-Collimator and angle gage blocks for optical settings of angles.

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.

Use postpaid card. Circle No. 122

### Heavy-Duty Model For Multi-Head Pneumatic Riveting

A new compact, heavy-duty pneumatic rivet machine is reported as especially suited to multi-head or "cluster" installations. The Model 57 sets semi-tubular, full tubular or bifurcated rivets ranging from  $\frac{1}{8}$ " dia. x  $\frac{1}{8}$ " long to  $\frac{3}{16}$ " dia. x 1" long. A 3" stroke and 12" throat depth is provided. The machine sets rivets on varying centers down to 1". It operates on 60 to 150 psi shop air pressure.

Several Model 57 heads may be grouped on a single base and combined

with slide fixtures or transfer tables as one production unit for automatic cy-



Sets rivets  $\frac{1}{8}$ " dia. x  $\frac{1}{8}$ " long to  $\frac{3}{16}$ " dia. x 1" long.

clung. Maximum cycling speed is governed by rate at which rivets feed into the jaws. Stroke speed is easily adjusted to control impact when fragile materials are assembled.

The Milford Rivet & Machine Co., Milford, Conn.

Use postpaid card. Circle No. 123

## HIGHEST PRECISION AT LOW COST!

**Vernier Caliper Model 15050 EK5 (illustrated)**  
**from \$14.60**    Leather Case Included

- GUARANTEED ACCURACY TO 0.001"
- EASIER READING WITH DOUBLE VERNIER
- NO EYE STRAIN—DULL CHROME FINISH

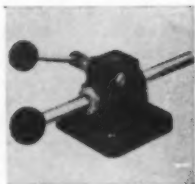
➔ Send for complete catalog of over 100 Helios Precision Measuring Instruments.

United States  
Representative

**KARL A. NEISE, Inc.**  
Dept. MT, 404 4th Ave., New York 16, N.Y.

**NEISE**  
MODERNTOLS

Use postpaid card. Circle No. 449



**DRILL JIG VISES.** The new Adjusto-Quick Jig-Lok eliminates special locking details. It incorporates the same automatic pressure control used exclusively on L-W Adjusto-Quick vises. Simple turning of the control automatically adjusts holding pressure from one up to 1500 lb. Two models are offered with bases 4"x4" or 5"x5". L-W Chuck Co., 23 So. St. Clair St., Toledo 4.

Use postpaid card. Circle No. 140

**AIR & ELECTRIC-POWERED NIBBLERS** cut ferrous and non-ferrous metals without distortion. One new model cuts corrugated steel by adjusting the cutting head. Cut material falls directly beneath the work, not hurled upwards—a safety factor. Light, medium, heavy, extra-heavy duty models cut materials to 1/4" steel, 5/16" aluminum. Fenway Machine Co., Inc., 3107 N. Broad St., Phila. 32, Pa.

Use postpaid card. Circle No. 141



**THREE NEW OIL BY-PASS RELIEF VALVES**, flange type. Models LFC-9 and LFC-10 are 2 1/2" and 3" sizes. At present, the 2 1/2" size is available for 60 lb. maximum control pressure; the 3" size, 100 lb. Model HFC-9 is a 2 1/2" valve for 325 lb. maximum pressure. Both 2 1/2" valves have 300 lb. standard flanges; 3" valve, 600 lb. The Fulflo Specialties Co., Inc., 436 Fancy St., Blanchester, Ohio.

Use postpaid card. Circle No. 142

## ENGINEERED MIST COOLANT EQUIPMENT

# Spraymist®

BY **BIJUR**

COMPACT • EFFICIENT • EASY TO INSTALL



Fully automatic operation saves time and trouble. Mist starts and stops with action of machine. No need for manual air valves.

Compact integral unit design includes built-in air filter, trap, regulator, gauge, solenoid valve, conduit box, pressurized reservoir, and coolant filter. No unsightly plumbing, extra valves or controls!

Spraymist available in 18 ounce, 1 gallon and 5 gallon units. 5 gallon units serves up to 20 jets.

**SPRAYMIST . . .** The modern, compact, engineered way to get all the advantages of mist cooling. Write today for further information.

2349



## BIJUR

LUBRICATING CORPORATION  
Rochelle Park, New Jersey

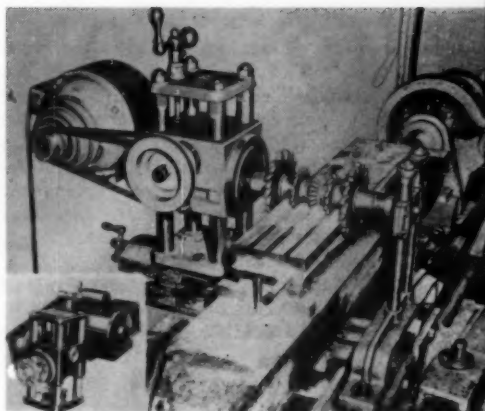


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## Two New Unit Sizes Added to Portable Milling Line

Two new unit sizes, Versa-Mil Models 1 and 3, broaden the Dumore milling equipment line to permit milling, drilling, boring, shaping, slotting, grinding, and related machining of small, medium, as well as large-sized work. Dumore claims all units are so compact that they can be easily attached to any standard machine tool.

Model 1, for smaller work, has a metal removal rate of 1/3 cu. in. per minute, and can be mounted on lathes 10" or larger. Model 2, the original unit, for medium size, general duty, can remove metal at the rate of 3/4 cu. in. per minute, and mounts on lathes 13" or larger. Model 3, for large work, removes metal at 1 1/2 cu. in. per minute, with 18", or larger, lathe mounting. The outboard arbor support accessory for Model 3, when used with extended arbor, permits heavy straddle milling



Model 1 (inset) is for smaller work. Model 3 is shown with outboard arbor support milling three slots and two sides of a large machine table, all at the same time.

and other machining at a greater distance from the tool face.

The Dumore Co., 1300 Seventeenth St., Racine, Wis.

Use postpaid card. Circle No. 143

*Helios*

## DIAL CALIPERS

Model UR68E

Sizes: 6" (illustrated)  
8" and 10"

from \$31.50 (without case)

PRECISION  
MEASURING  
INSTRUMENT



VERSATILE, ACCURATE, TIMESAVING, EASY TO READ

Send for the Complete Catalog of

**HELIOS QUALITY INSTRUMENTS**

**KARL A. NEISE, Inc.**

Dept. MT, 404 4th Avenue, New York 16, N.Y.

ONE OF MANY

**NEISE  
MODERNTOLS**

United States  
Representative

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### Bearings and Ball Screws

Scully-Jones recirculating anti-friction Tychoway bearings and Super-Cision ball screws are companions for supporting machine components moving in a straight line, and for positioning them with a minimum of mechanical force. The manufacturer reports that used together, they help make linear motions completely predictable, accurate and repeatable.

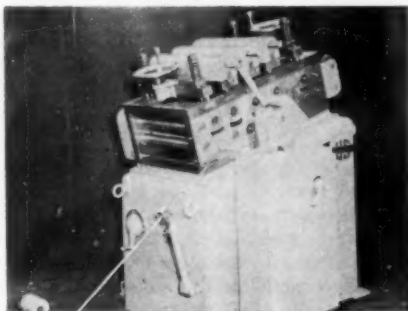
Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, Ill.

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### Machine Straightens Stock 16" Wide, 1/4" Thick

Model No. PDS-16H U.S. power driven straightener offers capacity for material up to 16" wide and up to a maximum of 1/4" in thickness (cold rolled steel, hot rolled steel, brass, copper, aluminum). This unit is designed for the removal of coil set from mate-

rial in coil form usually used in conjunction with automatic feeding equipment for advancing the material into punch presses, press brakes or other fabricating equipment.



A 5 hp variable speed drive unit offers outputs from 10' to 50' per minute. U.S. Tool Co., Inc., Ampere (E. Orange), N.J.

Use postpaid card. Circle No. 125

131

the latest  
completely  
illustrated  
**free**  
CATALOG  
No. 207

**PALMGREN**

A complete line of vises and rotary tables for production, tooling and maintenance. 68 different models and types. Vise jaw sizes from 1 1/2" to 8".

**Chicago Tool and Engineering Co.**  
8384 South Chicago Ave.  
Chicago 17, Ill.

Use postpaid card. Circle No. 452

### KUHLMANN 2- and 3-dimensional PANTOGRAPH ENGRAVERS



For general  
engraving—  
marking—  
profiling—  
die and mold  
milling

**ANTARES INSTRUMENTS INC.**  
55-02 37th Avenue  
Woodside 77, New York

Use postpaid card. Circle No. 453

MACHINE and TOOL BLUE BOOK





Always...  
**ON THE SPOT!**

Here is a fast, accurate gage that has a hundred uses on the production line. It can be used right at the machine, in production, in the inspection department . . . and in the gage laboratory.

Simple to use, it requires no special skill on the part of your personnel. It weighs only 3 lbs.

**MICROtol\* 170A** transistorized gaging system includes a battery-powered amplifier and four types of interchangeable gage heads for use with production comparators, height gages, snap gages, ID or OD gages and similar bench inspection devices. These replace cumbersome and unreliable mechanical or pneumatic elements.



**INDICATOR GAGE HEAD** used with standard height gage-stand for surface plate work.



**AGD GAGE HEAD** used with snap gage for production line inspection.



**FRICTIONLESS GAGE HEAD** used with comparator stand to check production parts.

#### FEATURES

- Only 2 control knobs
- One adjustment zeros both scales
- Large meter with 4.6" scale
- Dual range—from either  $\pm .0003"$  to  $\pm .003"$  or  $\pm .001"$  to  $.010"$
- Accurate—transistorized throughout
- Pocket-sized— $5\frac{1}{4}"$  square by  $3\frac{1}{16}"$
- Mounting adapters and gage head stored in cover
- Carrying case handle doubles as amplifier stand
- Lightweight—weighs only 3 lbs.
- Battery powered—can be used anywhere
- AA dry cells can be used in emergency
- AC line operated unit available.

**BASIC GAGES START AT \$341.00**

Contact your nearest Cutler-Hammer office or order direct from



### AIRBORNE INSTRUMENTS LABORATORY

DEER PARK, LONG ISLAND, NEW YORK

A DIVISION OF CUTLER-HAMMER, INC.

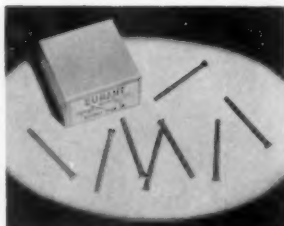
\*Trademark

### New Sizes in Durant Headed Pins

Durant Tool Co. announces it is introducing heretofore unobtainable sizes in headed pins. These sizes include pins up to  $\frac{1}{4}$ " in dia. in 2", 4", and 6" lengths. All tool steel Rockwell C 58/60 honed finish with heads left soft, these new headed pins are said to have no pickup and are guaranteed uniform. These are added to the firm's 111 different sizes.

Durant Tool Co., 12 Thurbers Ave., Providence 5.

Use postpaid card. Circle No. 126

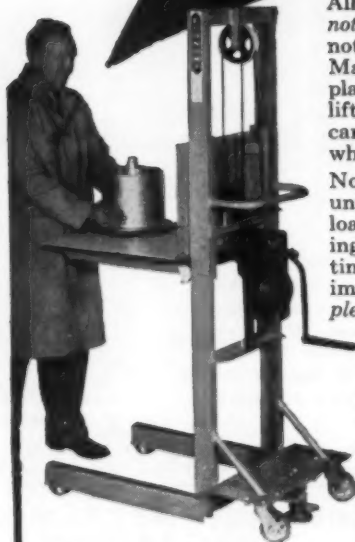


Up to  $\frac{1}{4}$ " dia.; 2", 4", 6" long.

# ALL NEW

## MARK II Shoplifter

New Low Price \$195.00 \*  
New Capacity Full 750 lbs.



All lifters at this price are *not* the same. Compare and note the quality of the new Mark II, which now replaces the Type D Shoplifter. Full 750 lb. capacity can be handled safely anywhere on the platform.

No-drift, full control hoist unit. Raise or lower the load to fractional positioning. Built for years of continuous service with minimum maintenance. *Complete* safety features included at no extra cost.

Applicable in small plants for "too heavy to lift loads" and in large plants to supplement powered equipment. The economical way to transfer molds and dies, unload trucks, stack in narrow aisles, or raise parts and machinery to working levels.

**ECONOMY  
ENGINEERING**

4505 W. Lake St., Chicago 24, Ill.

Write for specifications and other details.

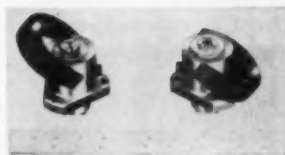
\*Priced f.o.b. Chicago

Use postpaid card. Circle No. 454

## Collet Holding Fixtures

A new line of collet holding turn-table fixtures for small-area index set-ups has been announced. These fixtures take 3 C collets. Their small size allows close grouping of several fixtures on small index tables. Height is 2 $\frac{3}{8}$ " and the flange area covered is approximately 3 $\frac{3}{8}$ " dia. Standard, small press, chucking, milling, tapping, and other machines can be tooled easily with these fixtures.

Zagar Inc., 23900 Lakeland Blvd., Cleveland 23.



For small-area index set-ups.

Use postpaid card. Circle No. 127



A complete line of Unisorb Pads and Unisorb Level-Rite Mounts for fast and simplified installation of all types of machinery and equipment.

- Cuts installation costs up to 70% . . . eliminates bolts and lag screws . . . speeds installation . . . no drilling required . . . machines can always be moved quickly.
- Eliminates up to 85% of transmitted vibration and noise . . . increases machine life and efficiency . . . reduces maintenance.
- Unisorb Level-Rite provides fast and precise leveling.
- Safe, sure grip . . . can be cemented if needed.
- Unisorb is available in wide variety of densities and thicknesses — for maximum efficiency. Send for bulletin, today.

FE9-64

# UNISORB

203 SOUTH STREET  
BOSTON, MASS.

## Cutters For Wire Rope And Prestressed Cable

The compound-lever, bench cutters are made in two sizes. The No. B size will cut  $\frac{5}{8}$ " and lighter wire rope and  $\frac{3}{4}$ " and lighter prestressed cable. No. C size is used for cutting  $1\frac{1}{4}$ " and lighter wire rope and prestressed cable larger than  $\frac{3}{4}$ ". Blades are made of HCHC steel for long wear.



T. H. Lewthwaite Machine Co., 312  
E. 47th St., New York 17, N.Y.  
Use postpaid card. Circle No. 128

## Cut Cutting Costs KELLER POWER HACK SAWS 5 SIZES ... 10 MODELS



### MODEL

3CH

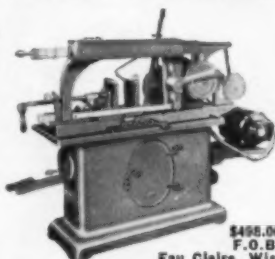
WET

CUT

6 $\frac{3}{4}$ "

X

6 $\frac{3}{4}$ "



\$495.00

F.O.B.

Eau Claire, Wis.

CONTROLLED FEED PRESSURE, 40 to 170 lbs., two speeds and automatic lift on return stroke gives you faster cutting, longer blade life. Rugged, Dillite bearings throughout, 45° swivel vise and other features. Ask your Industrial Distributor about KELLER Power Hacksaws or write for Bulletin 360 with prices.

KELLER DIV.

*Sales Service Mfg. Co.*

2361 University Ave. St. Paul 14B, Minnesota  
Use postpaid card. Circle No. 456

## BALANCED ALLOY LEAD HAMMERS



### HANDLES AND MOULDS

1, 1 $\frac{1}{2}$ , 2 $\frac{1}{2}$  and 5 lb. sizes—order your alloy lead hammer requirements from your mill supply house.

or direct from:

**KITZMAN MFG. CO.**

Manufacturers Of Lead Hammer Products

15061 Hartwell Ave. Detroit 27, Mich.

Use postpaid card. Circle No. 458



## SPELLMACO "SPOTTERS"

A matched set of transfer punches  
for toolmakers, machinists & tool cribs  
Used for transferring location of threaded, drilled  
and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel—Carefully heat treated and tempered for long life—0025 undersize to facilitate use—Black oxide finish

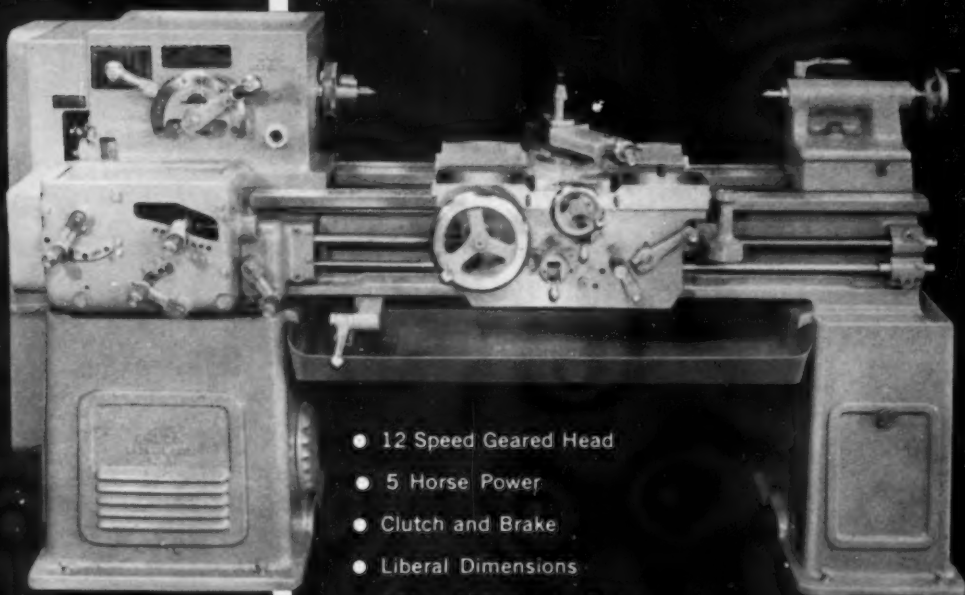
Set No. 3-17. 28 punches with indexed stand—sizes  $\frac{3}{32}$ " to  $\frac{1}{2}$ ", by  $\frac{1}{64}$ "—plus handy  $\frac{17}{32}$ " size. Length 4-7/8" ONLY \$19.40

Single sizes available

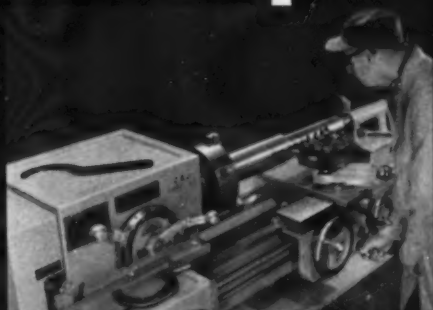
**R. L. SPELLMAN CO. - URBANA, OHIO**

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# THE **C** 16" AND 18" MASTER MODEL GH LATHES



- 12 Speed Geared Head
- 5 Horse Power
- Clutch and Brake
- Liberal Dimensions
- 36" to 156" Center Distances



**HUSKY**

**BUILT-IN PRECISION**

**LONG LIFE**

**LOW INITIAL COST**

**16" x 6' — \$3240**

THE **C**

**CARROLL-JAMIESON  
MACHINE TOOL CO.**

IN OUR 58th YEAR

BATAVIA, OHIO

## Accurate Clearance from O.D. to WEB...



makes drills  
sharpened on  
**STERLING  
DRILL  
GRINDERS  
CUT  
FASTER,  
LONGER**

### Model "DV"

Grinds ALL drills  $\frac{1}{8}$ " to  $2\frac{1}{2}$ ",  
90° to 140° included angle,  
2-3 or 4 lips.

SIMPLE, positive adjustments with built-in direct reading gauges allow accurate setting of clearance angle and included angle. Grinding action generates a true conical clearance angle that is constant from O.D. to web. Drill enters work easier, cuts freer, produces more holes per grind. Set-ups are fast because no chucks or collets are used. Locating on lip being ground produces accurate centering.

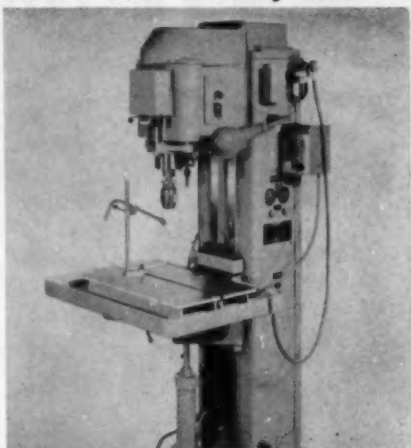
For a **LOW COST** Drill grinder with **BIG CAPACITY** ask your distributor about the **STERLING Model "DV"** or write for complete information.

**McDONOUGH  
MANUFACTURING CO.**

1520 Galloway • Eau Claire, Wis.

Use postpaid card. Circle No. 460

## Drilling Machine Drills 3/16"—5/8" in Alloy Steel



Two ranges of spindle speeds (with eight speed changes in each range) cover from 300 to 1800 rpm.

A new vertical universal drilling machine, with infinite hydraulic feed control in conjunction with air feed, has been announced. The hydraulic unit is adjustable for the amount of feed required and assures steady feed on interrupted cuts or break-through.

This new No. 3 machine has a drilling capacity of 3/16" to 5/8" in alloy steel. Work table is automatically positioned by air for quick change of tools and fixtures. Two ranges of spindle speeds (with eight speed changes in each range) cover from 300 to 1800 rpm. Solenoid units built into the machine synchronize clamping and indexing fixtures with spindle cycle.

Snow Manufacturing Co., 435 Eastern Ave., Bellwood, Ill.

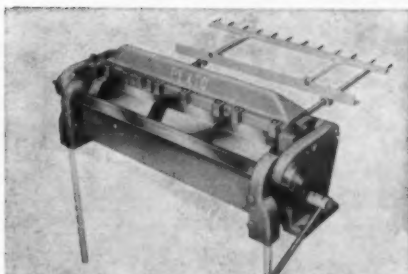
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## Box and Pan Brake Bends Sheet Metal Up to 16 Ga.

The new PX-24 box and pan brake bends sheet metal up to 16 ga. and offers many refinements in gauging and adjustments.

The Pexto flip-over gauge gives 0°





to 24" positioning without reversing or

removing the gauge bar. A stop collar is adjustable to any angle 0° to 135°. Fingers are arranged to form 3/4" to 24" in 1/4" increments, with a full 3" forming depth with 1/2" recess of underside of fingers.

New speed of performance is made possible by the design of upper bar and bar clamp.

The Peck, Stow & Wilcox Co., South-  
ington, Connecticut.

Use postpaid card. Circle No. 130

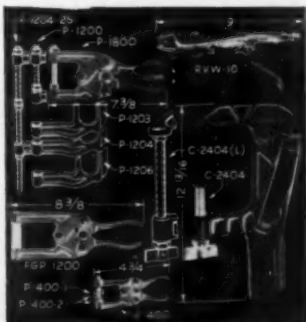
### THERE ARE KNU-VISE PRODUCTS

### TO MEET YOUR EVERY CLAMPING NEED

(OVER 150 MODELS)

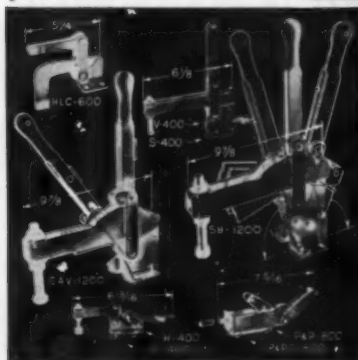
LAPEER devices are the choice of leading manufacturers for all operations requiring fast and reliable clamping.

Recognized as clamping engineers we can give you much valuable assistance. We will gladly discuss your clamping problem at your plant.



### UNMATCHED FOR RUGGED USE, DEPENDABILITY, SPEED AND LONG SERVICE

They were developed through exhaustive tests in laboratory and years of practical use.



### LAPEER MANUFACTURING CO.

3052 DAVISON ROAD, LAPEER, MICH.

Manufacturers of over 150 models of manually and air-operated clamps and pliers.

WESTERN DIV.: PECK AND LEWIS CORP.  
4436 Long Beach Ave., Los Angeles 58, Calif.

CANADIAN DIV.: HIGGINSON EQUIP.  
SALES, 1131 Pettit Road, Burlington, Ontario

Use postpaid card. Circle No. 461



## Lathe Handles Work Up to 40 Tons, Cuts To 3/4" Depth



Four sizes offered, with 74" to 108" swings over the bed.

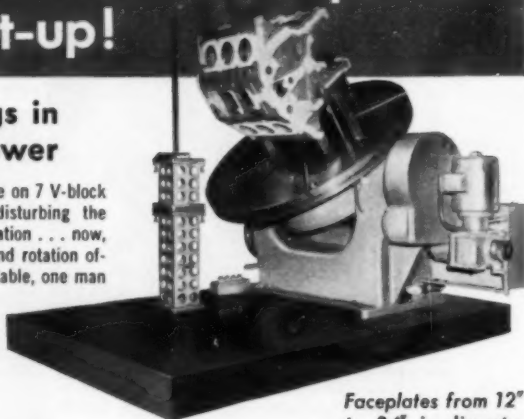
The Maxi-Swing engine and tracer lathe has been designed to handle heavy work, up to forty tons and will make precision cuts to 3/4" depth. It is available in four sizes with swings from 74" to 108" over the bed. The bed is 56" wide with four hardened and

ground replaceable Vee-ways. The tracer lathe is completely equipped with carriage mounted power unit and motor, all hoses and fittings, hydraulic tracer valve, angle tracer slide with hydraulic actuating cylinder, periscope-type precision optical viewer, template

## Dimensional check on 7 planes in one set-up!

### Up to 50% savings in time and manpower

Every angle, diameter, line, critical surface on 7 V-block planes is completely checked without disturbing the initial set-up. Previously a two-man operation . . . now, with motor-powered, push-button tilting and rotation offered by the ROTAB precision positioning table, one man quickly, accurately runs the entire inspection in about half the time. This is how ROTAB is paying off for a major diesel engine manufacturer . . . ROTAB will pay off for you, too. Write for details.



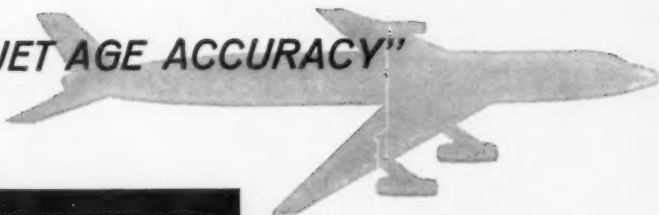
Faceplates from 12" to 84" in diameter

**MACHINE PRODUCTS** Corporation

6771 E. McNICHOLS ROAD • DETROIT 12, MICHIGAN

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for "JET AGE ACCURACY"



## **FOREDOM**

*miniature*

### **FLEXIBLE SHAFT MACHINES**

*supply the control and  
precision needed for  
sensitive instrumentation*

**Grinding & Finishing • Engraving & Marking • Tool Maintenance  
Filing • Buffing & Polishing • Sanding & Brushing  
Mold & Die Work • Deburring**

The Sensitive Altimeters made by Kollsman Instrument Corporation must give altitude readings of complete accuracy throughout a wide range of pressures and temperatures, and Foredom Flexible Shaft Machines help assure this precision. In the photograph shown here, a Kollsman craftsman uses a bench model Foredom machine for one of the many delicate finishing operations required on an altimeter mechanism body.

Foredom's slim handpieces respond to the slightest pressure and give perfect control at all speeds. And there's nothing better for getting into small openings and other inaccessible spots. If you work on metal, plastic, leather, rubber, wood or glass, there's a Foredom machine and handpiece ideally suited to your operation.

For more information, write for catalog 210-M6

**FOREDOM ELECTRIC COMPANY, INC.**

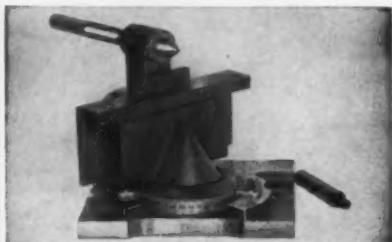
*Manufacturers of miniature power tools*

**BETHEL, CONNECTICUT**

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## THE CRYSTAL LAKE DIAMOND-CONE WHEEL DRESSER FOR SUPERFINE FINISH:



1. One to Four Microinch Surface Finish.
2. Hydrodynamically Controlled Motion.
3. Coolant flushed wheel surface during dressing.
4. Double Cone Construction.
5. Direct Radius Control to .0001".
6. Oil Sealed bearings.
7. Universal use — Cylindrical, internal & surface.

Write for Literature

### CRYSTAL LAKE ENGINEERING CO.

Engineers and Designers Since 1920

10 Gates St., P.O. Box 98, Crystal Lake, Ill.

Dealer Inquiries Invited.

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## Revolutionary New Chuck and Actuator!



Safe, proven Gamet Air Chuck and Power-grip Chuck Actuator installs easily on your lathe. Saves money—gets results. Makes it possible for you to:—

- Use lathe for both bar and chucking work.
- Use the draw tube hole for coolant, or tools.
- Eliminate air leaks and reduce fly-wheel effect.

Guaranteed for One Year. Chuck Size 4 1/4" to 14".

### POWER GRIP, INC.

ROCKFALL, CONN.

Use postpaid card. Circle No. 465

holder brackets and adjustable supports for flat templates.

Internal geared face plate drive, pendant controlled operation including apron feed clutches, 7 1/2" diameter tail stock spindle, and traveling operator platform, are standard equipment for either engine or tracer lathe.

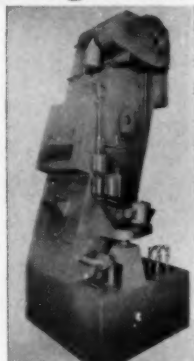
This machine is designed for accuracy and convenience of use in steel mill maintenance, shipbuilding and repair, missile and similar types of work in the heavy industries.

The American Tool Works Co., Pearl St., at Eggleston Ave., Cincinnati 2.

Use postpaid card. Circle No. 131

## Conveyor-Type Washer Cleans Small Stamped & Forged Parts

This Ransohoff vertical conveyor-type washing machine, designed for the inter-process cleaning of small stamped and forged parts, washes a 300 to 1500 lb. work load each hour. With its 11' vertical conveyor only 16 sq. ft. of floor space is required.

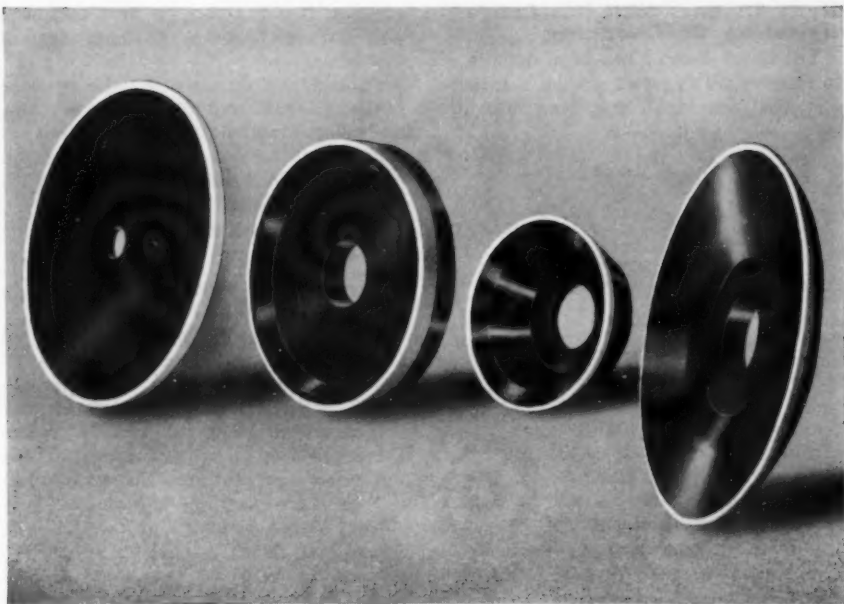


A separate conveyor carries the work to the charging hopper. Parts are given a thorough spray cleaning as they are conveyed upward to the end of the conveyor where parts are automatically discharged. Parts are discharged at or near ceiling level or the conveyor may be extended to discharge the work on the floor above.

Unit is complete with conveyor assembly, pump, motors, and switches.

Ransohoff Co., North 5th St. at Ford Blvd., Hamilton, Ohio.

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## MANHATTAN DIAMOND WHEELS

***Cut Cool and Free—Last Longer***

Manhattan Diamond Wheels are engineered to give you faster, cooler cutting and longer life.

Advancements in Diamond Wheel construction and NEW RESINOID BOND developments fully utilize the advantages of both man-made and natural diamond insuring top performance from all Manhattan Diamond Wheels.

**TRY** Manhattan Diamond Wheels on your toughest application—find out for yourself how they perform in your plant—under your conditions—on your operation.

- New Bonds
- Longer Life
- Bonded for Specific Grinding Requirements
- Natural or Man-made Diamonds

**"MORE USE PER DOLLAR"**

ENGINEERED  
RUBBER  
PRODUCTS  
...**"MORE USE  
PER DOLLAR"**



**WRITE TO DIAMOND WHEEL DEPARTMENT  
MANHATTAN RUBBER DIVISION—PASSAIC, N.J.  
RAYBESTOS-MANHATTAN, INC.**

Use postpaid card. Circle No. 466

### Hand Cleaner Will Not Cause Irritation Or Chapping

The hand cleaner has been developed to remove all types of grease, oil, loose dirt, cast iron dust, graphite, ditto ink,



industrial ink, and paint. Also, it will eliminate odors which commonly come in contact with the hands.

This hand cleaner is of the water type and is guaranteed not to cause any irritation or chapping of the skin. The manufacturer also states the

cleaner does not contain any abrasives and will not present drainage system problems.

Packed in 8-oz. polyethylene squeeze bottles, 1-gal. and 5-gal. metal cans, and 30-gal. and 54-gal. steel drums. A sample will be furnished by request on company letterhead.

Metalloid Corp., Huntington, Ind.

Use postpaid card. Circle No. 133

### Spark Proof Fan For Aget Dust Collectors

A new spark proof, cast aluminum fan has been announced for use in Aget's dust collectors. The fan is offered, without additional cost, on the standard Model 800, 1100, and 500 series Dustkops. Advantages reported are lighter weight because of aluminum, and improved suction efficiency.

Aget Manufacturing Co., 1384 Church St., Adrian, Mich.

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**NEW**



**Patented CONCENTRICITY GAGE**

- QUICKLY INTERCHANGEABLE SPINDLE FOR LASTING ECONOMY

LARGE, LIGHT-WEIGHT HANDLE  
ROTATES WITH SPINDLE  
IN BALL BEARINGS  
(INDICATOR REMAINS STATIONARY)

*Write for 32-page catalog*

**ZERO**

**ZERO INTERNAL GAGE CO.**  
11360 Schaefer Hwy • Detroit 27, Mich.

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**BORING BAR**

by  
**MODERN**

**KILLS VIBRATION, CHATTER!**



Scientifically designed to diminish vibration in boring, the MODERN boring bar has various size holes drilled from each end to minimize harmonic vibration. Hole diameters were determined by using a VIBRATION METER and probing bar every 1/4". The cavity is filled with shock absorbing material under vacuum, thus obtaining a dead bar of superior strength.

**MODERN**

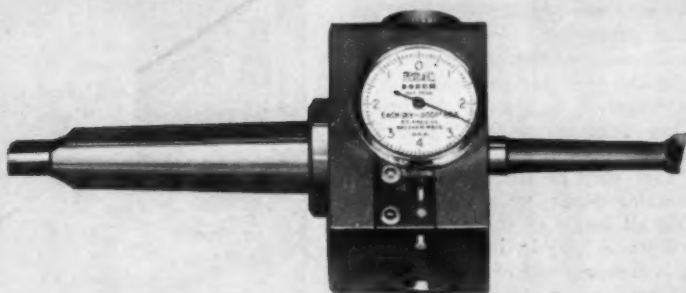
**MANUFACTURING CO., Inc.**  
680 Davisville Road, Willow Grove, Pa.

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MACHINE and TOOL BLUE BOOK



# NOW



**Tolerance  
of .000050"**

Put your Bokum tool in the Bokumicro-Dial Boring Head\*. For set-up, bore a hole a few thousandths undersize. Measure the hole and move the dial indicator (which moves the tool) to the exact reading you wish—you can read directly 50 millionths of an inch! You get absolute accuracy on production runs or tool room work. It's Bokumagic! Write today!

**BOKUM TOOL COMPANY, INC.**



**14775 WILDEMERE AVENUE**

**DETROIT 38, MICHIGAN**

\*PATENT PENDING

### Slotter Features Pushbutton Control, Ease of Set-Up

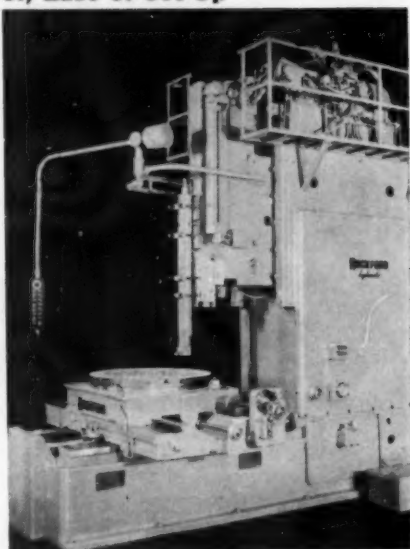
The important feature of the new SM "36" stroke Hy-Draulic Slotter is the counterbalanced pendant, operating through 240° range. This permits operator to run machine from any position. No levers are required for the engagement of any feed or traverse movement. The pendant provides selection for longitudinal, rotary and transverse movements. Two-speed traverse is available, enabling the operator to reposition the stroke, lengthen or shorten it directly from the pendant, without levers or cranks, or stopping the machine.

The ram may be tilted for travel in any angular plane, providing applications on all kinds of slotter work.

The drive is fully hydraulic, with two speeds and servo control to 40 hp pump.

The model is equipped with built-in dividing head for power indexing of keyways, serrations, gear teeth and other machining cuts.

Rockford Mach. Tool Co., Rockford, Ill.



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# *haskins*

## The Handiest Tool in Your Shop

Depend on equipment that does the job best with the lowest cost.

Use *haskins* equipment for longer life, more trouble free service, and real economy.

Send for Catalogs Today!



Polishing

Wire Brushing

Grinding

Rotary Filing

Buffing

**R. G. HASKINS CO.**

**2645 W. Harrison St., Chicago 12, Illinois**

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Want low-cost parts finishing?  
NOW—CHOOSE FROM

# 7 NEW ALMCO VIBRASHEEN MACHINES

TO DO YOUR

- DEBURRING
- DESCALING
- BURNISHING
- SURFACE REFINEMENT
- CLEANING

**10 to 100 Times  
FASTER!**

7 SIZES FOR EVERY JOB REQUIREMENT

Model	Tub Capacity	Tub Size, Inside		
		Length	Width	Height
VT-70	½ gallon	7"	4½"	6"
VT-71	1 cu. ft.	12"	12"	12"
VT-72	2½ cu. ft.	15"	16"	18½"
VT-75	5 cu. ft.	31"	17"	19½"
VT-77	7 cu. ft.	31"	17"	22½"
VT-712	12 cu. ft.	35"	25"	30¾"
VT-717	17 cu. ft.	47"	25"	30¾"



New VT-72 Vibrasheen being unloaded into optional hoist-pan. Note convenient height of controls.



**IT'S A FACT!** With the seven (7) new ALMCO Vibratory Machines, you can expect finishing time cycles 10 to 100 times faster than with standard horizontal barrel finishing equipment. It's a significant production break-through, made possible by creating constant vibratory motion to activate the entire mass of media and parts in the finishing container, as compared to only 20% activation with conventional barrel finishing methods. The uniform vibratory motion of the media in recessed areas, blind holes and small I.D. dimensions make it possible to obtain optimum results on a multitude of applicable parts with intricate configura-

tions that can not be completely processed in standard horizontal barrel machines.

**What's more,** this amazing metal finishing machine only requires 50% of the floor space that is taken up by any other machine of this type with a similar capacity. Time and motion is at the absolute minimum with all convenient operating conditions.

**Tub features.** Holds a 2½ cu. ft. load of parts and media. Equipped with vibrating mechanism adjustable for impact range of from 600 to 2550 lbs.; has a vibration frequency of 3380 rpm with variable drive optional. Pivot through 180° arc. Lined with tough ¾" plastisol. Quick-acting cam-lock drain door facilitates flushing of tub.

Investigate today, the ALMCO Vibra-Sheen way!

**FREE**

**NEWS ABOUT  
ALMCO'S NEW PRODUCTS**

New Almco Album describes the latest in metal finishing machines, methods and media. Write today for free copy!



## ALMCO

Queen Products Division • King-Seely Corporation  
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# Why Wait FOR SPECIAL TAPS, DIES AND GAGES?

**RUTLAND  
TOOL & SUPPLY CO.**

**Has them IN STOCK for  
IMMEDIATE DELIVERY!**



## HIGH SPEED

SIZE	THREAD
4	32-48-60-64
5	30-32-35-48-80
6	31-47-48-56-60
7	32-40
8	24-30-36-38-40-44-48
9	24-28-32-40
10	28-30-36-40-48-64
12	20-28-32-36
14	20-24-28
1/16	60-64
5/64	72
3/32	48
7/64	48-56
1/8	32-40
5/32	32-36-40
9/64	36-40
11/64	36
3/16	20-24-32
13/64	32
7/32	24-28-32
1/4	18-24-26-27-30-32-36-40
5/16	16-20-22-27-28-32-40

## RIGHT HAND TAPS

SIZE	THREAD
1-3/4	8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20-24
1-15/16	8-10-12-14-16-18-20-24-28
2	4-1/2-8-10-12-16-18-20
2-1/15	12-14
2-1/8	12-16-20
2-3/16	12-16
2-1/4	4-1/2-8-12-14-16-18
2-5/16	12-18
2-3/8	12-16-18
2-1/2	8-10-12
2-9/16	18
2-5/8	12-16-20
2-3/4	16
2-7/8	8-12-16
3	8-16
3-1/4	8-12-16
3-1/2	8-12-16
3-7/8	6
4	8-12

## SPECIAL

(Also available in high speed left hand)

SIZE	THREAD
3/8	12-16-18-20-27-28-32-36-40-48
7/16	12-16-18-22-24-27-28-30-32-36-40
1/2	12-14-16-18-22-24-26-27-28-30-32-40
9/16	16-20-24-27-28-30-32-40-48
5/8	12-14-16-20-24-27-28-32-36-40
11/16	11-16-18-20-24-27-28-30-32
3/4	9-11-12-14-16-20-24-26-27-28-32
13/16	10-14-18-20-32
7/8	10-12-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-32
1	10-12-16-18-20-24-27-32-40
1-1/16	12-14-16-18-20-24
1-1/8	8-10-14-16-18-20-24-32
1-3/16	8-10-12-14-16-18-20-24
1-1/4	8-10-14-16-18-20-24-32
1-5/16	12-14-16-18-20-24-32
1-3/8	8-10-14-16-18-20-24
1-7/16	8-10-12-16-18-20-24
1-1/2	8-10-14-16-18-20-24-28
1-9/16	18-20-24

Above only partial listing of our specials —  
Ask for Free Catalog

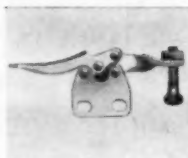
**RUTLAND TOOL & SUPPLY CO.**

9048 E. Washington Blvd. • Pico Rivera, Calif.  
OXford 9-1027 • RAYmond 3-9581

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## Tiny Toggle Clamps

Improved Series 105 De-Sta-Co "Tiny Toggle" clamps feature a new base design which assures a stronger clamp and slotted mounting holes to simplify final adjustments.



Offering holding pressures up to 42 lb., the clamps are available with either solid or U-shape work-holding bars. Four different bases are also offered. The clamps are designed to hold small assemblies during multiple wiring, soldering and similar operations.

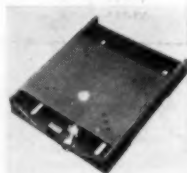
Priced at \$1.65 each in quantities of 1-49, \$1.40 each in quantities of 50-249, and \$1.25 each in quantities of 250 up.

Detroit Stamping Co., 330 Midland Ave., Detroit 3, Mich.

Use postpaid card. Circle No. 136

## Quick Sliding Motor Bases

"Quick - Slide" motor bases of the low "pancake" type are designed for use in variable-speed sheave installations where space is at a premium.



Provision is made for rapid release of the adjusting screw. Motor base can be moved quickly to shorten center-to-center distance and free V-belts from grooves for sheave adjustment.

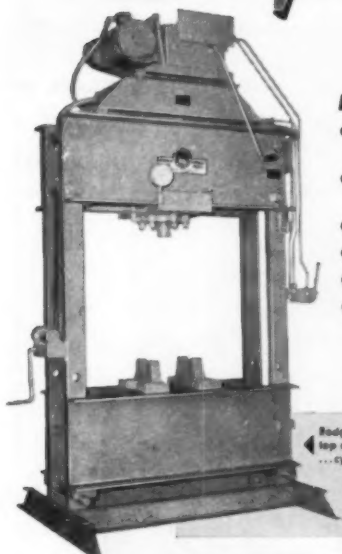
Height is 1-9/16" or 1-21/32" and amount of movement is 4 1/2" or 6", depending on NEMA motor frame number.

Bases may be used with any V-belt drives, but are particularly designed for use with variable-speed drives.

T. B. Wood's Sons Co., Chambersburg, Pa.

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# A *Rodgers* Shop Press is **BEST** for YOU!

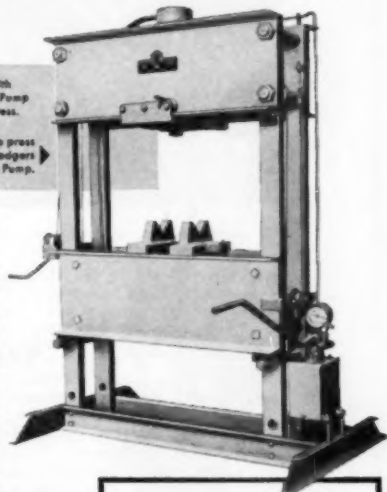


Rodgers 100 ton shop press with top mounted Greenlee Power Pump ... cylinder travels width of press.

Rodgers 100 ton shop press with Rodgers 2 speed Hand Pump.

## HERE'S WHY:

- **LONGEST RAM TRAVEL** with maximum hydraulic power throughout entire stroke.
- **REMOVABLE CYLINDER** for independent hydraulic power away from the press.
- **CYLINDER TRAVEL** full width of press, either way.
- **OPEN ENDS** allow long pieces to extend through sides of press.
- **EXTRA WIDE** inside work space to handle bigger jobs more easily.
- **GREATER STRENGTH** with heavy bar stock sides and pins—bearing blocks support bolster to give uniform distribution of pressure.



**W**HEN YOU INVEST in a shop press it is more important to compare performance than initial cost!

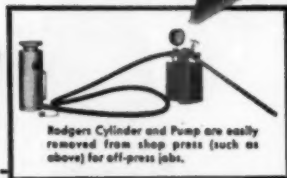
Rodgers Shop Presses are designed and built for the most versatile service, and longest trouble-free life. In the shop they handle hundreds of diversified jobs... pressing, bending, straightening, assembling. For field work the Rodgers cylinder and pump are easily removed from the press, making an ideal portable power unit for jacking, lifting, heavy shaft removal and similar work.

Rodgers produces the most complete line of shop presses available—capacities from 60 to 400 tons—in varied standard models with power pumps, top mounted or placed at the side—or hand pumps with 2 or 3 speeds.

When you compare shop press performance and cost you will find a Rodgers is best for you, too. Ask your Rodgers Representative for complete details—or write us.

SEND FOR **NEW CATALOG**...

It gives useful information and complete specifications.



Rodgers Cylinder and Pump are easily removed from shop press (such as above) for off-press jobs.



**RODGERS HYDRAULIC, Inc.**

**Pioneers in High Pressure Hydraulics Since 1932**

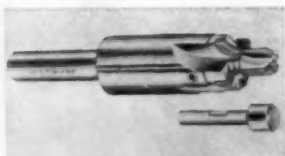
7453 WALKER STREET • MINNEAPOLIS 26, MINNESOTA

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### Carbide-Tipped Port Contour Cutters

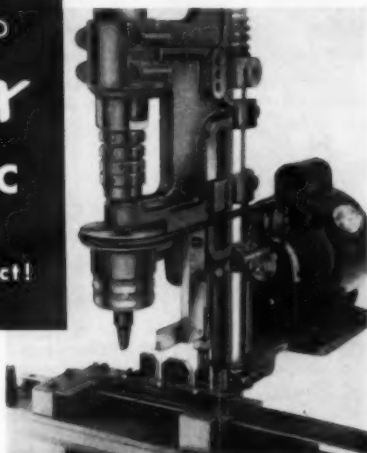
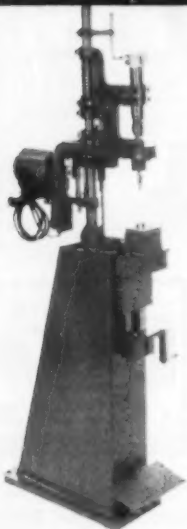
A complete line of improved carbide-tipped port contour cutters is offered for AND 10050 standard hydraulic fittings. They are available in sizes from  $\frac{1}{8}$ " to 2" tubing OD. Cutters have precision ground bodies for bushing guidance and are equipped with a removable tap hole reamer that may be interchanged with an optional end pilot. This offers two tools in one and may be set up for the needs of the job. Tool is of the four-flute type.

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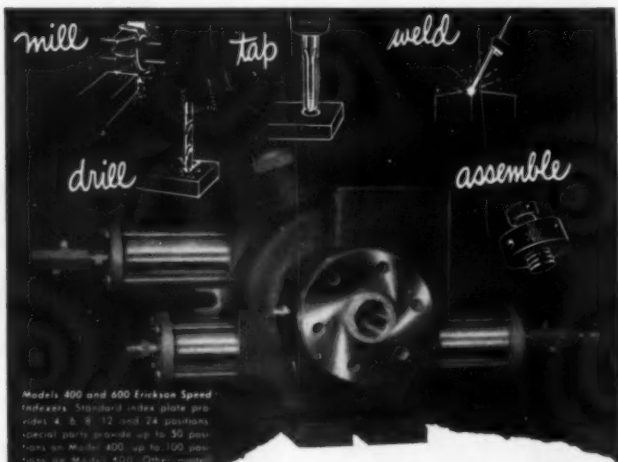
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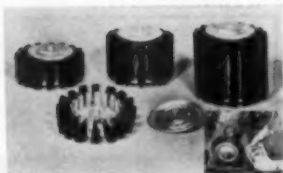
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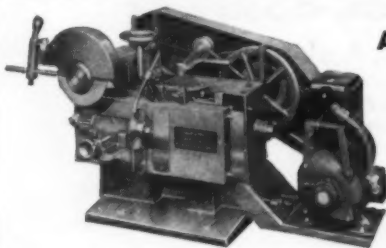
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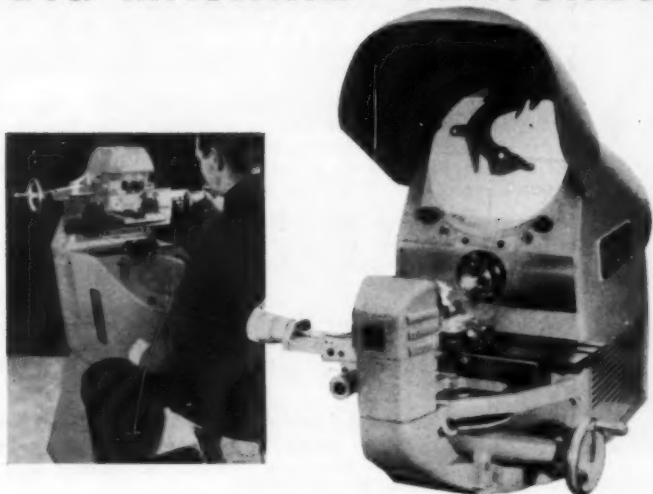
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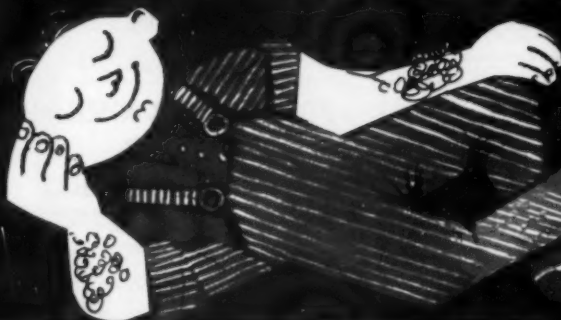
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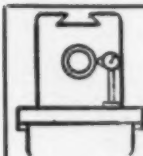
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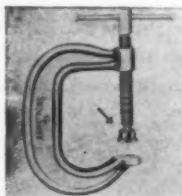
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# products index

## A

Abrasive Cloth, Paper, Discs,  
Wheels, Stones, Belts, etc.,  
57, 194-195, 318  
Abrasive Cut-Off Machines, 12  
Abrasives, rubber bonded, 30  
Actuators, 294  
Adapter Calculator Slide Rule,  
255  
Aluminum Bars, 79, 130  
Aluminum Stock, 79, 130  
Angles, 234  
Arbors, 254  
Automation Control, 307

## B

Bacterial Inhibitor, 115  
Balancing Machines & Tools, 261  
Balanced Cranks, 251  
Barrel Finishing Machines, 299  
Bar Machines, automatic, 16-17,  
44-45, 106  
Bars, Aluminum (See:  
Aluminum Bars)  
bronze, 79  
Bearings, 79  
bronze, 79  
motor, 79  
roller, 246  
Bending Machines & Equipment,  
50, 178, 234, 266, 301  
Blades, cut-off (See: Tools,  
cutting-off, blade)  
Blanks, 96, 232  
form tools, 96  
Blocks, step, 90  
V-, 12  
Bolts, 90  
Boosters, 243  
Boring Bars and Tools, 74, 82,  
158, 202, 296  
Boring, Drilling, Milling  
Machines, 253  
tape controlled, 32A-B  
Boring, Drilling, Tapping  
Machines, 253  
Boring, Heads, 188, 235, 239, 297

Boring Machines, 63  
jig, 22, 278  
Jig, numerically controlled, 22  
jig, optical, 129, 162  
Boring Mill Light, 270  
Broaches, keyway, 242  
Brush Top Cams, 255  
Buffing Machines, 14, 248, 271  
Burs, 67, 154, 157  
Bushings, 69 73  
drill and jig, 24

## C

Calipers, 168, 281, 283  
Cam Milling, 254  
Cams, 199  
Cathetometers, 215  
Centers, lathe, 254  
live, 20-21, 216, 240  
Choppers, scrap, 214  
Counterbores, 91  
Countersinks, 91  
Cut-off Machines, 12, 26, 213,  
223, 249  
Cutting Fluids, 94-95, 245  
Cylinders, hydraulic, pneumatic,  
118

## D

Deburring Machines & Tools, 14  
Die Sets, 274  
Die Stock, 53  
Dies, 165, 173, 262, 300  
compound, 66  
key-aligned, 66  
perforating & magnetic, 165  
Dowel Pins, steel (See: Pins,  
leader & dowel)  
Drawing Compounds, 94-95  
Dressers, angles, 256  
radius, 89, 256  
Drill Drifts, 254  
Drill Heads, 1, 64  
multiple spindle, 1, 64  
Drill Sharpeners, 34-35

Drilling Attachments, 64  
multiple spindle, 64  
Drilling Equipment, 270  
Drilling Machines, 34-35, 39  
automatic, 39  
bench, 43, 59  
multiple spindle, 39, 43, 59  
press, 43, 59, 237  
radial, 237, Inside Back Cover  
turret, 85  
Drilling & Tapping Heads, 1  
Drilling & Tapping Fixtures, 259  
Drilling & Tapping Machines, 253  
Drilling Units, 11  
Drills, 67, 173, 232  
carbide, 232  
chip breaker, 25  
high speed steel, 232  
twist, 25  
Duplicating Machines, 72  
(automatic tracing), 72  
Dust Collectors, 221, 229

## E

Engraving Machines, 23, 97, 284  
Engraving Tools & Attachments,  
97

## F

Facing Heads, 208  
Facing Machines, 253  
Feeding Machines, 183  
Feeders, 73  
Feeds, parts, vibrating, 68  
Files, 157  
Filing Machines, 31  
Finishing Machines, 299  
Fixture Locks, 217  
Flat Stock, ground, 77, 157  
Flexible Shaft Machines &  
Equipment, 155, 268, 293, 298  
Fluid Power Training, 250  
Forming Machines, 52  
Furnaces, electric, heat-treating,  
161, 213, 226, 233, 263  
gas, heating-treating, 90

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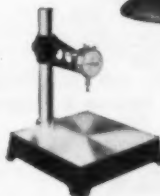
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**G**

Gage Blocks, 160  
 Gages, 300  
   air, 311  
   comparator (See: Comparators)  
   concentricity, 296  
   dial indicator, 311  
   height, 285  
   internal, dial, 88, 285  
   micrometer, dial (See: Micrometer Dial Gages)  
   plug, 152  
   ring, 152  
   snap, 152, 285  
   thread, 152  
   transistorized, 285  
 Gaging Equipment, 285  
 Gear Cutting Machines, 92-93  
 Gear Hobbers, 92-93  
 Gear Measuring Equipment, 92-93  
 Gear Production Equipment, 92-93  
 Gear Shapers, 92-93  
 Gear Shaving Machines, 92-93  
 Gears, Geneva, 199  
   helical, 245  
   spiral, 245  
   spur, 245  
   worm, 245  
 Graduating Machines, 3  
 Grinders, portable, electric, 58  
   portable, pneumatic, 202, 227  
 Grinding Machines, 248  
   bench, 271  
   (built-in dust collector), 70  
   carbide tool, 271  
   centerless, 160A, 176-177  
   chucking, 8-9  
   crankshaft, 160B-C  
   cylindrical, 160B-C  
   drill, 290  
   flexible shaft (See: Flexible Shaft Machines & Equipment)  
   flute, 197  
   form relieving, 169  
   jig, 162  
   precision, 6, 8-9  
   surface, 6, 89, 273  
   tap, 188, 197  
   transfer type, 160B-C  
 Grinding Fixtures, form relieving, 169  
   tool & cutter, 89, 169  
 Grinding Wheels, diamond, 294, 295  
   resinoid bonded, 86  
   silicon carbide, 86  
   vitrified bonded, 86  
 Grooving Tools, 74

**H**

Hammers, 157, 242  
   lead, 288  
   plastic, 242  
 Handles, hammer, 258, 288  
   machine, 251  
 Hardness Testing Equipment, 116, 252  
 Hinges, 260  
 Honing Machines, 47, 78, 87  
 Honing Tools, 47, 87

**I**

Indexing Machines, 199, 303  
 Inspections & Measuring Devices, 6, 58, 88, 152, 285, 296, 311  
 Inspection instruments, optical, 6, 215, 305

**J**

Jaws, chuck, 20-21, 73  
 Jig Boring, 252  
 Jig Grinding, 252  
 Jig Feet, 90  
 Jigs & Fixtures, 90

**K**

Keys, fixtures, 90  
 Knobs, hand, 90

**L**

Lapping Compounds, 236  
 Lathes, automatic, 19  
   contour, duplicating, tracer-controlled, 34-35, 46, Back Cover  
   engine, toolroom, 34-35, 46, 51, 289, Back Cover  
   finishing, 2  
   geared head, 210  
   precision, 210, 289  
 Chucking Equipment, 118  
 Chucking Machines, 16-17  
 Chuck Actuators, 294  
 Chucks, 118  
   air, 294  
   collet, 38, 80-81  
   gear, 189  
   lathe, 20-21  
   magnetic, 204, 254  
   magnetic, sine, 56  
   scroll, 189  
 Clamps, 12, 90, 291  
   adjustable, 274, 291  
   air-operated, 291  
   "C", 274, 291  
   fixture, 209, 291

strap, 90  
 toggle, 90  
 Clamping Levers, 251  
 Cleaners, 94-95  
 Collet Closer, 239  
 Collet Pads, 73  
 Collet Pushers, 160D, 320  
 Collet Stop, 248  
 Collet Tubes, 320  
 Collets, 73, 80-81, 160D, 254, 320  
   master, 73  
 Comparators, dial, 285, 311  
   optical, 6, 305  
 Compound Rests, 251  
 Coolant Pumps, 187  
 Coolants (See: Cutting Fluids)  
   turret, 19, 34-35, 153, 210  
 Layout Dye, 110, 255, 258  
 Levels, precision, 40  
 Levelers, 207, 287  
 Lifters, 286  
 Lighting Equipment, 270  
 Looping Tool, 83  
 Lubricants, 94-95, 167, 170

**M**

Machine Tool Exposition—1960, The, 36  
 Marking Devices, Stamps, 3, 7, 18  
 Marking Dies, 3, 7, 18  
 Marking Equipment, 3, 7, 18  
 Marking Machines, 3, 7, 18  
 Micrometer Dial Indicators, 311  
 Milling Cutters, 67, 117, 173, 319  
   carbide tipped, 181, 230  
   end mill, 67, 117, 173, 266, 319  
   face, 67, 117  
   form, 67, 117  
   plain, 67, 117  
   side, 67, 117  
 Milling Machines, 253, 304  
   horizontal, 210, 218, 304  
   plain, 218, 304  
   universal, 218  
   vertical, 10, 218  
 Mist Cooling Systems, 77  
 Mist Coolant Generators, 258, 259, 282, 304  
 Molds, hammer, 288  
 Motors, shaftless, 32  
 Mounted Wheels, 57  
 Mounting Equipment, 287  
 Mounting Pads, 287

**N**

Nippers, 83  
 Notching Equipment, 173

Numbering Heads, 3, 7, 264  
Nut Tappers, 253  
Numerically Controlled Equipment,  
32A-B  
Nuts, flanged, 90  
Nutsetters, power, 190

## O

Optical Flats, 185

## P

Pantographs, 97, 284  
Parallels, 280  
box, 234  
Pins, headed, 274  
leader & dowel, 100  
taper, 239, 245, 265  
Plastics, 130  
Plates, angle, 234  
surface, 234  
Pliers, 291  
Polishing Machines, 14  
Positioning Tables, 292, Inside  
Back Cover  
Press Brakes, 42, 48-49, 178, 277  
Press Room Equipment, 183  
Presses, bench, 62  
blanking, 33  
crankshaft, 33  
deep throat, 13  
die tryout, 33  
drawing, 33  
forming, 33  
four-slide, 52  
gap type, 33, 60, 62, 270  
horn, 270  
hydraulic, 33, 62, 65, 301, 309  
O.B.I., 13, 33, 60, 228, 270  
punch (power), 33, 60, 62, 178,  
183, 200  
punch, hand, 178  
straight side, 60, 270  
straight side double crank, 228  
straightening, 301, 309  
Punches & Dies, 315  
Punches & Pusher Tools, 302

## Q

Quenching Oils, 94-95

## R

Reamers, 173, 232, 319  
Reciprocating Tools, 280  
Riveting Machines, 245, 302  
Rod Parters, 178  
Rollers, 178

Routers, 67  
Rust Preventives, 94-95, 115, 255,  
276

## S

Salts, heat-treating, 94-95  
Saw Blades, band, 15, 41, 58, 77,  
157, 205, 279  
circular, 61, 75, 279  
cut-off, 279  
hack, Inside Front Cover, 15,  
77, 157, 279  
high speed steel, 205, 279  
hole, 77  
segmental, 279  
slitting, 75, 117, 173, 279, 319  
Saw Sharpeners, 304  
Sawing Machines, 31  
band, 76, 225  
cut-off (See: Cut-Off Machines)  
hack, Inside Front Cover, 288  
Screw Drivers, power, 190  
Screws, cap, set, socket and  
machine, 90, 209  
Services: Boring, Grinding,  
Lapping, Milling, Repairing,  
etc., 82, 94-95, 104, 194-195  
Sharpeners, 48-49, 210, 219  
Shearing Machines, 48-49, 102,  
178  
Shearing Tools, 178  
Shears, lever, 278  
Shim Stock, 29  
Shims, laminated, 29  
Sines, chuck magnetic (See:  
Chucks, magnetic, sine)  
Sine Plates, 56  
Sine Blocks, 231  
Sleeves, 254  
Slide Rules, 255  
Slotters, 75  
Socket Screw Products, 90, 209  
Sockets, 254  
Speed Reducers, 209  
Spindles, grinding, 275  
Spotters, 288  
Spring Coilers, 83, 178, 278  
Stampings, 7, 29  
Steel and Steel Stock, 130, 272  
bars, 130, 247, 272  
die, 53  
ground flat stock, 130, 272  
tool, 130, 269, 272  
Straight Edges, 234  
Straightening Machines, 183  
Studs, 90, 209  
Surface Finish Indicators, 257,  
267

Surface Finishing Measuring  
Equipment, 257, 267

## T

Tables, elevating, adjustable, 198,  
222  
rotary, index, 193, 198, 284  
Tap Extractors, 175  
Tappers, 201  
hand, 27, 204  
lead screw, 27  
Tapping Attachments, 64, 71  
lead screw, 27  
Tapping Heads, 64, 71  
Taps, 28, 84, 173, 224, 300, 319  
Acme, thread, 28  
Tap Cartridges, 241  
Threading Tools & Equipment, 74,  
104  
Threading Machines, 253  
Tool Holders, 4, 73, 90, 158  
for throwaway inserts, 262  
Tool Tips, carbide, 262  
Tools, carbide, 67, 239, 262  
cutting-off, blade, 98  
special, 173  
Tote Pans, 242  
Tracer Attachments for Lathes,  
317  
Tracer Controlled Equipment,  
32A-B, 317  
Transfer Machines, 160 B-C  
Transfer Punches, 288  
Transfer Screw Sets, 260  
Tube Cutting Machines, 26, 213,  
223  
Tube End Finishing, 203  
Turn Tables, 199  
Turrets, lathe, 220  
Turret & Cross-Slide Automation  
Control, 307

## V

Valves, 118  
control, 118  
Vises, bench and machine, 20-21,  
284  
collet, 259  
milling machine, 20-21

## W

Washers, 90  
Wear Parts, 262  
Welding Equipment & Supplies,  
54-55  
Wheels, hand, 251  
Wrenches, adjustable, 37  
Work Holders, 12, 73

A	
A. K. Tool Company, Inc.	252
Abart Gear & Machine Company	209
Accurate Bushing Company	24
Ace Drill Corporation	232
Acme-Danneman Company, Inc.	274
(Danneman Die Set Division)	
Acme Industrial Company	307
Acme Tool Corp.	280
Adamas Carbide Corporation	262
Adjustable Clamp Company	274
Advance Car Mover Company, Inc.	278
Aget Manufacturing Company	221
Airborne Instruments Laboratory	285
Allegheny Ludlum Steel Corporation	269
Allen Industries, Alva	200
Allen Collet Manufacturing Company	320
Allen Manufacturing Company	100
Almco Queen Products Division	299
(King-Seely Corporation)	
Alpha-Molykote Corporation	170
American Chain & Cable Company	12
(Allison-Campbell Division)	
American Tool Works	
Company	Inside Back Cover
Ames Company, B.C.	311
Anderson Brothers Manufacturing	
Company	309
Antares Instruments, Inc.	284
Anton Machine Works	280
Armstrong-Blum Manufacturing	
Company	Inside Front Cover
Armstrong Bros. Tool Company	4
Arrow Machinists	259
Atlantic Machine Tool Works	22
Atlas Press Company	46
(Clausing Division)	
Atrax Company	67
Austin Industrial Corporation	218-219
Auto Moulding & Manufacturing	
Company	260
B	
Backus Machine Works	249
Baj Tool Company	242
Balcrank, Inc.	251
Baldor Electric Company	271
Barker Engineering Company	304
Barnes Drill Company	47
Barnes Company, Inc., W. O.	205
Bay State Abrasive Company	194-195
Beaver Gear Works, Inc.	245
Benchmark Manufacturing	
Company	183
Benco Collet Manufacturing	
Company	160-D
Biddle Engineering Company	308
Bijur Lubricating Corporation	282
Blake Company, Edward	197
Blanchard Machine Company	86
Bliss Company, E.W.	13
Boggis Company, Henry P.	188
Bokum Tool Company	297
Bremil Manufacturing Company	278
Brightboy Industrial Division	30
(Weldon Roberts Rubber Company)	
Brown & Sharpe Manufacturing	
Company	181
(Nelco Tool Division)	
Brush Instruments	257
(Division Clevite Corporation)	
Buck Manufacturing Company	237
Bunting Brass & Bronze Company	79
Burgmaster Corporation	85
Busch Company, J.C.	234
Bystrom Company	248
C	
Cadillac Stamp Company	7
Carroll-Jamieson Machine Tool Company	289
Chandler Tool Company	235
Chicago Latrobe	25
Chicago Manufacturing & Distributing	
Company	167
Chicago Tool & Engineering Company	284
Cincinnati Lathe & Tool Company	34-35
Cincinnati Milling Machine Company	8-9
(Grinding Machine Division)	
Cincinnati Shaper Company	48-49
Circular Tool Company	75
Clark Instrument, Inc.	116
Clausing Division	46
(Atlas Press Company)	
Clearing Machine	
Corporation	Back Cover
(Div. U. S. Industries, Inc.)	
Cleveland Crane & Engineering	
Company	102
Cleveland Punch & Shear Works	
Company	315
Clover Manufacturing Company	236
Collis Company	254
Comet Tool Company	202
Commander Manufacturing Company	201
Comtor Company	88
Concentric Tool Corporation	240
Continental Machine Company	223
Cook Inc., Lawrence H.	198
Cook's Lead Hammer Service	258
Cooley Electric Manufacturing	
Corporation	233
Cooper-Weymouth, Inc.	214
Cosa Corporation	162
Covel Manufacturing Company	6
Crane Packing Company	185
Criterion Machine Works	74
Crystal Lake Engineering	
Company	294
D	
Danly Machine Specialties, Inc.	33
Danneman Die Set Division	274
(Acme-Danneman Company)	
Delta Power Tool Division	43
(Rockwell Manufacturing Company)	
Denison Engineering Company	65



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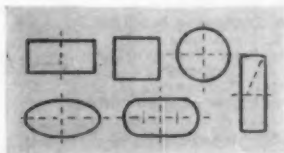
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DeVlieg Microbore .....	158
(Division DeVlieg Machine Company)	
Dreis & Krump Manufacturing Company .....	277
Durant Tool Supply Company .....	274
Dykem Company .....	110

## F

Eclipse Counterbore Company .....	91
Economy Engineering Company .....	286
Eisler Engineering Company .....	199
Ellis & Sons, Inc., Geo. D. ....	255
Empire Tool Company .....	98
Enco Manufacturing Company .....	220
Erickson Tool Company .....	303
Ex-Cell-O Corporation .....	69

## F

Fellows Gear Shaper Company .....	92-93
Felters Company .....	287
Flynn Manufacturing Company .....	188
Foredom Electric Company .....	293
Fulmer Company, C. Allen .....	78
Futurmill, Inc. ....	230

## G

Gaertner Scientific Corporation .....	215
Gallmeyer & Livingston Company .....	273
Gisholt Machine Company .....	19
Gorton Machine Company, Geo. ....	72
Grant Manufacturing & Machine Company .....	245
Graymills Corporation .....	258
Green Instrument Company .....	97
Greenlee Brothers & Company .....	106
Grob, Inc. ....	76
Hannifin Company .....	62
(Div. Parker-Hannifin Corp.)	

## H

Hanson-Whitney Company .....	224
Harco Engineering Company .....	209
Harig Manufacturing Company .....	89
Hartford Special Machinery Company .....	11
Haskins Company, R. G. ....	298
Heimann Manufacturing Company .....	260
Heller Tool Company .....	41
Himoff Machine Company .....	254
Horton Machine & Tool Company .....	368
Houghton & Company, E.F. ....	94-95
Houston Grinding & Manufacturing Company, Inc. ....	216
Hovis Screwlock Company .....	66
Huppert Company, K.H. ....	213
Hypno Tool Company .....	28

## I

Ingersoll Milling Machine Company .....	82
---	----

## J

J & S Tool Company .....	20-21
Jacobs Manufacturing Company .....	80-81
Jarvis Corporation .....	27
Johnson Gas Appliance Company .....	90
Johnson Machine & Press Company .....	270
Johnson & Son, Inc., S. C. ....	115
Jones & Lamson Machine Company .....	63-305

## K

Kingsbury Machine Tool Corporation .....	39
Kitzman Manufacturing Company .....	288

## L

L & J Press Corporation .....	60
Ladish Company .....	15

Laminated Shim Company .....	29
Landis Machine Company .....	104
Lapeer Manufacturing Company .....	291
LaSalle Steel Company .....	247
Latrobe Steel Company .....	53
Leland-Gifford Company .....	317
Lemert Engineering Company .....	302
Lewis Company, G.B. ....	242
Lewthwaite Machine Company, T.H. ....	234
Lincoln Electric Company .....	54-55
Linley Brothers Company .....	278
Lloyd Tool Corporation .....	304
Lodge & Shipley Company .....	51
Logansport Machine Company .....	118
Lucas Machine Division .....	32a-b
New Britain Machine Co., The)	
Lucifer Furnaces, Inc. ....	161
Ludlow Papers (Industrial Division) .....	276

## M

M.B.I. Export & Import, Ltd. ....	129
McDonough Manufacturing Company .....	230
Machine Products Corporation .....	232
Machine Tool Publications .....	308
Madison-Kipp Corporation .....	202
Magna-Lock Corporation .....	56
Manhattan Rubber Division .....	295
(Raybestos-Manhattan, Inc.)	
Manhattan Supply Company .....	204
Micro Balancing Inc. ....	261
Micrometrical Manufacturing Company .....	267
Midwest Tool & Engineering Company .....	222
Miller Fluid Power Division .....	243
(Flick-Reedy Corporation)	
Millers Falls Company .....	58
Modern Machine Tool Company .....	26
Modern Manufacturing Company .....	296
Moore Special Tool Company .....	193
Morse Twist Drill & Machine Company .....	173
Notch & Merryweather Machinery Company .....	279
Mummet-Dixon Company .....	208
Murray-Way Corporation .....	14

## N

National Acme Company .....	44-45
National Machine Tool Builders' Association .....	36
Neise, Karl A. ....	281-283
Nelco Tool Division .....	181
(Brown & Sharpe Manufacturing Company)	
New Britain Machine Company, The .....	37a-b
(Lucas Machine Division)	
New Hermes Engraving Machine Company .....	23
Niagara Machine & Tool Works .....	42
Nicholson File Company .....	157
Nilson Machine Company, A.H. ....	52
Noble & Westbrook Manufacturing Company .....	3
Northwestern Tools, Inc. ....	90
Norton Company .....	160b-c
Numberall Stamp & Tool Company .....	264

## O

Oliver Instrument Company .....	31
O'Neil-Irwin Manufacturing Company .....	178
Ottemiller Company, Wm.H. ....	209

## P

Parker-Hannifin Corporation .....	62
(Hannifin Company Division)	
Pearlee Metal Products Company .....	239
Pedrick Tool & Machine Company .....	50
Perkins Machine & Gear Company .....	83
Pine's Engineering Company, Inc. ....	203

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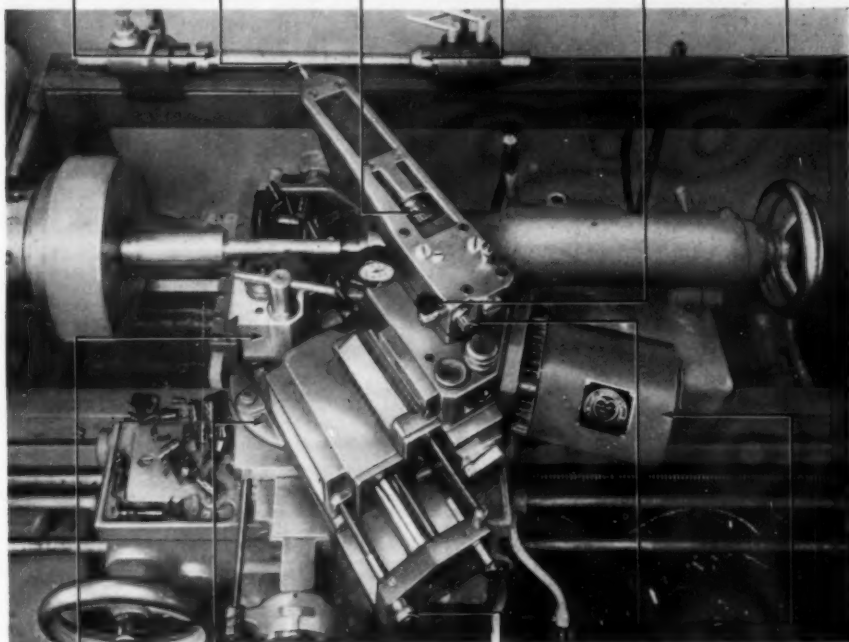
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Pope Machinery Corporation .....	275
Powergrip, Inc. ....	294
Pratt & Whitney Company .....	152, 153, 154, 155
Precision Tool Manufacturing Company .....	239

## Q

Queen City Machine Tool Company .....	248
---------------------------------------	-----

## R

R. O. Manufacturing Company .....	169
Raybestos-Manhattan Division .....	295
(Raybestos-Manhattan Rubber Company)	
Relton Corporation .....	245
Richards Company, J.A. ....	266
Rico Tool Company .....	239
Rockwell Manufacturing Company .....	43
(Delta Power Tool Division)	
Walker Turner Division .....	59
Rodgers Hydraulic, Inc. ....	301
Rothfuss Tool Company .....	256
Royal Master Grinders, Inc. ....	160-a
Rust-Lick, Inc. ....	255
Ruthman Machinery Company .....	187
Rutland Tool & Supply Company .....	360
Ryerson & Son, Inc., Joseph T. ....	130

## S

Sales Service Manufacturing Company .....	288
Sanford Manufacturing Company .....	70
Scherl-Tumico .....	168
Schmidt, Inc., Geo. T. ....	18
Schupack Supply Company .....	318

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Sentry Company .....	263
Service Machine Company .....	228
Sheldon Machine Company .....	210
Sid Tool Company .....	319
Simonds Abrasive Company .....	57
Simonds Saw & Steel Company .....	61
Somma Tool Company .....	96
Sonnet Tool & Manufacturing Company .....	246
Sossner Tap & Tool Corporation .....	84
Spellman Company, R.L. ....	288
Standard Boring Mill Lite Company .....	270
Standard Horse Nail Corporation .....	265
Standard Steel Specialty Company .....	245
Starrett Company, The L.S. ....	40
Stow Manufacturing Company .....	268
Sturtevant Company, P.A. ....	255
Sunnen Products Company .....	87
Super Tool Company .....	117
Supreme Products, Inc. ....	71
Sutton Tool Company .....	73
Syntron Company .....	68

## T

Taft-Peirce, Inc. ....	231
Tahlen Hammer Company .....	242
(Div. H.F. Soderling Company)	
Tammis Industries Company .....	256
Tap Cartridge Company .....	241
Thermo-Electric Manufacturing Company .....	226
Thompson & Son Company, Henry G. ....	77
Thor Power Tool Company .....	190
Thriftmaster Products Corporation .....	64
Tools, Inc. ....	204
Torrit Manufacturing Company .....	229
Torsion Balance Company .....	252
Training for Industry .....	250
Tree Tool & Die Works .....	10
Trico Fuse Manufacturing Company .....	259

## U

Universal Automatic Corporation .....	253
Universal Engineering Company .....	38
Unisorb (Felters Company) .....	287

## V

Van Norman Machine Company .....	176-177
Vanadium-Alloys Steel Company .....	272
Victor Machinery Exchange, Inc. ....	189
Vogel Tool & Die Corporation .....	213

## W

Wade Tool Company .....	2
Walker-Turner Division .....	59
(Rockwell Manufacturing Company)	
Walton Company .....	175
Wardwell Manufacturing Company .....	304
Warner & Swasey Company .....	16-17
Watts Brothers Tool Works .....	270
Webber Gage Company .....	160
Weldon Roberts Rubber Company .....	30
(Brightboy Industrial Division)	
Wells Manufacturing Company .....	225
Whistler & Sons, Inc., S. B. ....	165
Williams & Company, I.H. ....	37
Wilson, Inc., Thomas C. ....	227
Wilson Air Collet Closer, Inc. ....	239
Wilton Company .....	217
Woehr Machine Company, F.A. ....	207
Woods Machine Company, S.A. ....	32
Woodson Tool Company .....	266

## Z

Zagar, Inc. ....	1
Zero Internal Gage Company .....	296

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1	48-56-64-72-80-90	9/16	12-14-16-18-20-24-27-28-32-36-40	1-7/8	5-8-10-12-14-16-18-20-24
2	48-52-54-56-64-72-80	5/8	10-11-12-14-16-18-20-24-27-28-32-36-40	1-15/16	5-8-10-12-14-16-18-20
3	40-44-48-56-60-64	11/16	10-11-12-14-16-18-20-24-27-28-32-40	2	8-10-12-14-16-18-20
4	32-36-40-48-56-60-64	3/4	10-11-12-14-16-18-20-24-27-28-30-32-36-40	2-1/16	12-14-16
5	30-32-36-40-44-48-56-64-80	13/16	10-12-14-16-18-20-24-27-32	2-1/8	8-10-12-14-16-18-20
6	30-32-36-40-48-56-60-64-72-80	7/8	9-10-12-14-16-18-20-24-27-28-32-40	2-3/16	10-12-14-16
7	30-32-36-40-48-64	15/16	8-9-10-12-14-16-18-20-24-27-32-40	2-1/4	4 1/2-8-10-12-14-16-18
8	24-30-36-40-44-48-56-60-64-80	1	8-10-12-14-16-18-20-24-27-32-36-40	2-5/16	12-14-16-18
9	24-28-32-36-40	1-1/16	8-10-12-14-16-18-20-24-27-32-36-40	2-3/8	10-12-14-16-18
10	28-30-36-40-48-56-60-64	1-1/8	7-8-10-12-14-16-18-20-24-27-32-36	2-1/2	4-8-10-12-14-16-18
12	20-22-24-28-30-32-36-40-56-60	1-3/16	8-10-12-14-16-18-20-24-27-32	2-9/16	12-14
14	20-24-28-32-40	1-1/4	7-8-10-12-14-16-18-20-24-27-32	2-5/8	8-10-12-14-16-18
1/16	60-64-72	1-5/16	6-8-10-12-14-16-18-20-24-27-32	2-3/4	12-14-16
5/64	72	1-3/8	6-8-10-12-14-16-18-20-24-27-32	2-7/8	8-10-12-14-16
3/32	36-48	1-7/16	8-10-12-14-16-18-20-24-27-32	3	4-8-10-12-14-16
1/8	32-36-40-44-48	1-1/2	6-8-10-12-14-16-18-20-24-27-32	3 1/2	8-10-12-14-16
5/32	32-36-38-40-44-48	1-5/8	6-8-10-12-14-16-18-20-24-27-32	3 1/4	8-10-12-14-16
3/16	20-24-28-32-36-40-48	1-9/16	12-14-16-18-20-24	3 1/2	8-10-12-14-16
7/32	20-24-28-32-36-40	1-5/8	16-18-20-24	4	8-10-12
1/4	14-16-18-22-24-26-27-28-30-32-36-40-48-56-64	1-11/16	6-8-10-12-14-16-18-20-24		
9/32	18-20-24-27-28-32-40-64				
5/16	16-18-20-22-24-26-27-28-30-32-36-40-48-64				
11/32	20-28-32-40-48				
3/8	12-13-14-18-20-22-27-28-30-32-36-40-48				
13/32	30-32-36-40-48				
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2	56-64	1/2	12-13-20-28	1-1/2	6-8-10-12-16-18-20
3	56	9/16	12-18-20-24	1-9/16	8-10-12-16-18-20
4	32-36-40-48	5/8	11-12-18-20-24	1-5/8	8-10-12-14-16-18-20
5	40-44	11/16	11-16-24	1-11/16	8-10-12-14-16-18-20
6	32-36-40	3/4	10-16-18-20	1-3/4	8-10-12-14-16-18-20
8	32-36-40	13/16	10	1-13/16	8-10-12-14-16-18-20
10	24-30-32-40	7/8	9-12-14-18-20	1-7/8	8-10-12-14-16-18-20
12	24-28-32	1	8-12-14-16-18-20	1-15/16	8-10-12-14-16-18-20
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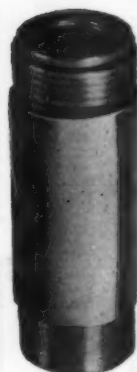
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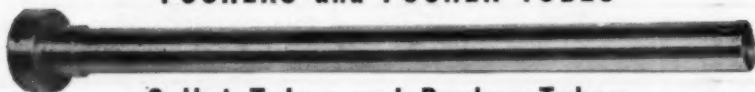
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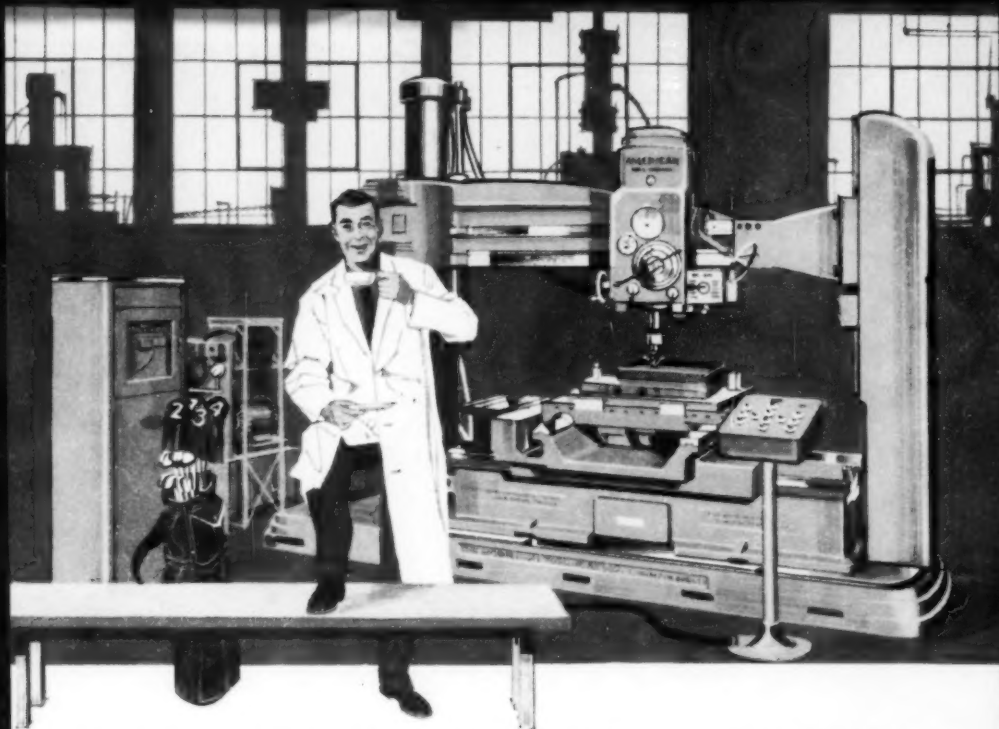


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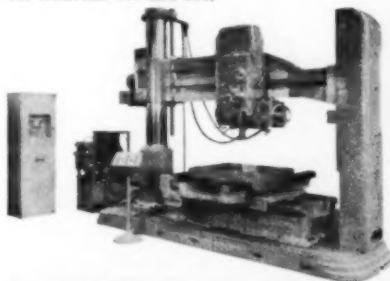
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## Top quality...sensibly priced The CLEARING-HARRISON

There's a lifetime of service in these rugged lathes plus features you'd expect to find only in far costlier machines.

**Induction Hardened Bed Ways • All Gear Heads • Anti Friction Bearings on the Spindle • Gap-type Beds**

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\*Base Price F.O.B. Chicago, Los Angeles, New York.

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Clearing's nationwide facilities assure you of prompt service always. Replacement parts and accessories are stocked at Clearing and are available through all three plants, at all service centers and through all Clearing dealers.

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